ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII. No. 12. CHICAGO, SATURDAY, SEPTEMBER 18, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.
608 SOUTH DEARBORN STREET
CHICAGO

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One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

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DISTRICT HEATING.

One of the important aspects of district heating is the bearing it has on the power business of the central station. In many industries heat or hot water is necessary in the performance of the manufacturing operations and it is usually in such class of establishments that the central-station company encounters the greatest competition when soliciting the adoption of purchased power by the manufacturer. Even for heating alone, in climates where the heating season is long, severe competition is encountered, many manufacturers claiming that as large quantities of exhaust steam are necessary the engine performs the functions of a cheap and effective reducing valve, generating at very low cost all the energy required for manufacturing.

Aside from the value of these contentions from an engineering standpoint, the fact remains that in almost every community there are a number of plants that come under this category and all efforts of the central station to secure the business are of no avail. The natural and logical solution of this problem, where conditions permit, is for the utility company itself to supply heating as well as power to such factories. Where the building lies within reasonable distance from the electric station this step is entirely feasible for the central station and is an activity which is a part of the natural development in the complete centralization of power generation.

It has been the experience of a large number of companies engaged in district heating that the business can be secured at rates equivalent to the cost to the customer operating his own plant. Possibly slightly higher rates can be charged, because of the convenience of the service. Residences and small business places, which pay higher prices for coal, can be charged more than larger buildings where an engineer is employed and where the coal cost approximates that of the heating company.

Many heating companies are not directly profitable but in most cases this can be traced to the lack of an equitable basis for charging. Steam costs, like electric costs, can be divided into service costs, capacity costs and output costs. As heating load-factors are substantially the same for all customers, it is fair to ignore the capacity costs and to consider costs as made up of service costs and output costs. Rates should be made up of a service charge and a charge for steam used.

To be successful steam-heating systems must be

treated with the same careful commercial management and technical analysis that is brought to bear upon the electrical side of the business. Due consideration must be given to the efficiency of the underground distribution system; to the nature of the business available; to the form of contract for service, and what is most important, the business must be solicited intsead of waiting for it to come forward of its own initiative.

These points were forcibly brought out in a paper presented by Mr. J. Grant De Remer before the convention of the Pennsylvania Electric Association last week, as reported on other pages of this issue. Certainly, at this time, when efforts must be made to secure business otherwise neglected for more easily secured contracts, serious consideration should be given the subject of district heating.

In addition to all other advantages of such service, the supply of heat makes the customer doubly dependent upon the central station and increases the value of the service to the community.

THE ELECTRIC FURNACE.

One of the interesting papers presented at the recent convention of the Association of Iron and Steel Electrical Engineers last week was that by Dr. Karl G. Frank dealing with "Progress in Iron and Steel Industry and the Electric Furnace." It is pointed out in regard to the latter that the increasing demands for very high quality and special alloy steels has necessitated the development of the electric steel furnace, and today without exception it is the best means to produce high quality steel. The principal advantages of the electric furnace are that it produces the highest temperature obtainable; it produces that temperature without contamination of the charge and it offers a ready and easy means to control that temperature. In view of these qualifications, it seems strange that the author should hold that the electric furnace is essentially a refining process and that actual melting will always be done otherwise. In fact, the important position held by the electric furnace in the industrial world at the present time may possibly be best realized by a statement of the fact that the present development requires over one million horsepower of electrical energy. It is true, however, that in the United States at the present time the electric steel-making capacity is under 100,000 tons per year, while the total production of steel from all kinds of fuel furnaces is more than 30,000,000 tons. Developments have proven, however, that electric steel furnaces can produce steel at any tonnage rate at a cost lower than any other fuel furnaces, and it is uniformally true that the quality of the product is much superior. The future of electric furnace development, therefore, depends largely upon the attitude taken and the policies adopted by the central-station companies.

The exploitation of this branch of the business is one of the most important matters now receiving the attention of the central-station industry. The many inherent advantages of the electric furnace, such as the ability to produce high-grade steel from comparatively low-grade ore, together with the general trend toward decreasing fuel, makes the outlook indeed very promising. The adaptability of the electric furnace to do the work more efficiently and better than that now done by other sources of heat is a great argument in its favor. Other reasons for the adoption of the electric furnace are that it can be obtained in sizes, capacities and temperature ranges to almost exactly fit the work contemplated; this in conjunction with the fact that the electric furnace requires no flues of other vents and can, therefore, be placed anywhere in the manufacturing plant, also because the source of heat is much closer to the material treated than any other method of heating, results in the higher efficiency of the electric furnace even after transmission, conversion and other losses are considered.

Considered from the standpoint of the utility company, the electric furnace load is extremely desirable. From actual experience electric furnaces show an annual load-factor on 12-hour service of about 40 per cent and about 70 per cent with 24-hour service. In most cases also it is possible to operate the furnace during off-peak periods even in plants operating 24 hours per day.

From the consideration being given this subject by utility companies in various localities, it is evident that a comprehensive movement is under way to add this desirable load to the central-station lines.

IMPORTANCE OF MEASURING DEMAND.

As the business of supplying electrical energy from central stations has developed, increasing attention has been given from year to year to the measurement of output, and consumption upon customers' premises. Meter accuracy and its maintenance have been increasingly recognized as important elements in the conduct of the business, and the expense involved in maintaining meter departments has been generally seen to be worth while from the standpoint of conserving revenue. Meters notoriously run slower with age and the neglect of recalibration may make serious inroads upon the legitimate revenue.

Corresponding attention has been given by but few companies to the measurement of the demand made by customers upon the power station, regardless of the fact that this is an important element in the cost of service, and indeed in hydroelectric systems may be by far the most important. This is probably because, after the customary scale of charges was put into effect, the revenue from most customers is not dependent upon a precise knowledge of their actual demand. Nevertheless, demand is an important element in framing a schedule of rates, so far as it is concerned with classes of customers. In specific cases, too, it is a direct element in determining the bill of the individual customer. It should be measured accurately not only in the latter case but in determining the characteristics of typical groups of customers.

Instruments for the measurement of maximum demand have long been available, but it is only within recent years that types have been placed upon the market which come sufficiently near to meeting requirements to be considered generally satisfactory. Recently, however, instruments of this kind have received much attention from manufacturers and have undergone rapid development. They deserve a wider use by operating companies. When placing them in service it should be realized that different types of instruments will probably prove the most suitable for different classes of service. A study of the different types, and trial installations on the premises of typical customers, should do much to increase the central-station official's knowledge of the loads which he is supplying, and put him in a position to more intelligently meet the future problems which he will be called upon to solve.

ELECTRIC COOKING IN THE WEST.

The report of the Electric Range Committee at the Northwest convention was in a way epoch-making. It is probably the most comprehensive effort which has yet been made in this country to compile data and information, as well as central-station experience, dealing with this subject. The report is largely due to the activities of the chairman of the committee, Mr. W. R. Putnam, of Salt Lake City. As might be expected in regard to a subject of this kind, there are many opinions, but a lack of quantitative data concerning the operating characteristics which are affected by this form of load. Where diversity-factors have been observed they are found to be rather favorable, so that the station peak is not much increased by a load of this kind. Much more information is needed, however, applicable to different local conditions, before reliable conclusions can be formulated on this subject.

Many portions of the West present conditions which are unique in respect to this matter. Fuel of all kinds is often scarce, with corresponding high prices, and in many communities gas is not available. Such conditions are especially favorable for securing an electric heating load, and where the problem has been energetically attacked, as at Billings, Mont., results can be depended upon to follow. A very considerable revenue awaits the central station in this field and, especially in the case of hydroelectric plants, but little additional investment upon the part of the operating company is involved.

Water heating for domestic use is an unavoidable side problem which must be met. A flat rate for this service seems to be generally favored, as the load can be easily arranged to give a high load-factor.

In introducing electric cooking, it seems desirable to use personal solicitation through thoroughly competent salesmen who can present the advantages of electric cooking in a convincing way and refrain from all claims which cannot be subsequently made good in practice. The manufacturers are ready to co-operate in advertising and demonstrations, and the latter are especially desirable, since education is usually necessary to get the best service from the electric range. Payment for equipment in installments is usually recognized to be necessary and means should be taken to finance this requirement.

THE CONVENTION OF THE NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

On other pages of this issue will be found the report of the convention of the Northwest Electric Light and Power Association held last week at Portland, Ore. This convention was successful in every way and was replete with interest from start to finish. Like so many of the other local associations, the Northwest Association has affiliated with the National Electric Light Association, although in the past there has not been entire sympathy on the Pacific Coast with the work of the national association. The holding of the annual convention of the latter association at San Francisco this year, with the consequent intimate commingling of the representatives of eastern and western companies, has done much to formulate a better understanding. President E. W. Lloyd of the National Association was present at the Northwest convention and his remarks upon that occasion could leave no doubt in the minds of the northwestern members that the chief executive of the National Association will do everything in his power to see that the interests of this section of the country are properly recognized.

Two causes of friction have been the specifications for overhead line work and the activities of the Committee on Accident Prevention. Representation from the Pacific states in the membership of these committees, as well as in the other activities of the association, should do much to remove all misunderstandings. There is already an appreciation of the difference in conditions in overhead line construction in the East and West, and no doubt the future work of the Overhead Line Committee will give full recognition to these differences.

The rules of the California Railroad Commission regarding inductive interference between power and telephone lines, and the proposed National Electrical Safety Code which is being formulated by the Bureau of Standards at Washington, are subjects of deep interest in the Northwest states. It is realized that regulations of this kind, if made mandatory, will put restrictions upon the freedom of operation of utility companies which may seriously embarrass them in certain instances. The subject of water power, and federal legislation in connection therewith, is another topic of deep concern and the companies operating in this territory are awaiting with much concern the enactment of federal legislation which will permit them to proceed with water-power developments.

Prominent Electrical Men on Naval Advisory Board.

The personnel of the Naval Advisory Board, announced by Secretary of the Navy Daniels on September 12, included several men conspicuous for their achievement in the development of electrical inventions and in the conduct of important business enterprises related to the electrical industry. Except for Thomas A. Edison, who was appointed chairman of the Board by Secretary Daniels, the members were chosen by 11 scientific societies, each selecting two representatives.

The membership is as follows:

Thomas A. Edison, chairman.

Dr. W. R. Whitney and Dr. L. H. Baekeland, of the American Chemical Society.

Frank Julian Sprague and B. G. Lamme, of the American Institute of Electrical Engineers.

Dr. Robert Simpson Woodward and Dr. Arthur Gordon Webster, of the American Mathematical Society.

Andrew Murray Hunt and Alfred Craven, of the American Society of Civil Engineers.

Matthew Bacon Sellers and Hudson Maxim, of the American Aeronautical Society.

Dr. Peter Cooper Hewitt and Thomas Robins, of the Inventors' Guild.

Howard E. Coffin and Andrew L. Riker, of the American Society of Automobile Engineers.

William Lawrence Saunders and Benjamin Bowditch Thayer, of the American Institute of Mining Engineers (metal).

Dr. Joseph William Richards and Lawrence Addicks, of the American Electrochemical Society.

William Le Roy Emmet and Spencer Miller, of the American Society of Mechanical Engineers.

Henry Alexander Wise Wood and Elmer Ambrose Sperry, of the American Society of Aeronautic Engineers.

The first meeting has been called for October 6, at the office of the Secretary of the Navy, Washington, D. C. Formal organization of the board will be made. Secretary Daniels will make an address outlining his ideas in forming the board, and the work will be subdivided so as to facilitate passing upon problems presented to the Board. These will have to do largely with inventions submitted to the Navy Department. It is also thought by the Secretary that the Board will be able to originate appliances and suggest modifications in the present equipment of the Navy which may have a far-reaching effect upon the science of naval warfare.

Thomas A. Edison, chairman of the board, is one of the most prolific inventors the world has known. His invention of the Edison incandescent lamp, the Edison system of distribution, the many fundamental inventions dealing with simple and multiplex telegraphy, the telephone, the Edison storage battery, his contribution to the development of the kinetoscope and the moving-picture field and other innumerable inventions place him in the forefront of the world of science and invention.

Brief biographical sketches of other members of the board, familiar to the electrical industry, follow:

American Chemical Society.

Dr. W. R. Whitney is director of the Research Laboratory of the General Electrical Company, Schenectady, N. Y. His successes there include the process which insured the commercial practicability of the photographic film; the "metalized" filament, or "Gem" lamp; the mechanically working tungsten; the gas-filled or half-watt lamp; the magnetic electrode arc lamp, and the X-Ray tube.

Dr. L. H. Baekeland, Yonkers, N. Y., a Belgian by birth, who invented Velox and other photographic papers, the Townsend electrolytic cell and photographic films and dry plates and "Bakelite," an insulating material of remarkable qualities entering into a wide range of electrical apparatus. He has been awarded medals by four American societies, was United States delegate to the International Congress of Chemistry in London, 1909, has been president of five American scientific societies and vice-president of two others, and holds degrees from Belgian, German and American universities, being at one time laureate of the four Belgian universities.

American Institute of Electrical Engineers.

Frank Julian Sprague, Milford, Conn., a graduate of the United States Naval Academy and later associated with Thomas A. Edison, who equipped the first electrically trained gun in the American navy; built the first electric trolley railways in the United States, Italy and Germany; introduced the electric elevator; invented the multiple-unit system of electric train control now used on all elevated and subway roads here and abroad; invented a system of control for automatic braking of trains and is developing high angle fire shrapnel. Mr. Sprague won gold medals at the Paris and St. Louis expositions.

B. G. Lamme, Springfield, Ohio, whose 140 inventions include practically all type of polyphase alternating-current apparatus and railway generators and motors. Mr. Lamme, who is chief engineer of the Westinghouse Electric & Manufacturing Company, has been an acknowledged leader in the last twenty-five years in the electrical engineering work of America and Europe.

Inventors' Guild.

Dr. Peter Cooper Hewitt, New York City, who is best known as the inventor of the Cooper Hewitt electric lamp, used for illuminating factories and for photographic work. He is also the inventor of the telephone relay and electric wave amplifiers, wireless telephone and telegraph apparatus, hydroplane, aeroplane and dirigible balloon apparatus and light transformers, changing the color of light rays.

Thomas Robins, Stamford, Conn., who is the inventor of numerous mechanical devices, including the belt conveyor for carrying ore and coal, for which he was awarded a gold medal at the Paris Exposition. He is enrolled in the American Legion, and last winter visited the front in France to study military conditions.

American Society of Automobile Engineers.

Andrew L. Riker, Detroit, who was the first president of the Society of Automobile Engineers and whose work resulted in placing the American automobile on a meritorious world-wide basis. He produced the first toothed armature and among the first electric vehicles, electric trucks, marine lighting plants and racing automobiles. In 1900 he was awarded a medal by the French government for meritorious automobile design.

American Society of Mechanical Engineers.

William Le Roy Emmet a graduate of the United States Naval Academy, who has achieved fame as an electrical engineer and inventor. His most important work has been in the development of alternating currents and of the steam turbine. He designed the machinery for the first ships driven by electric motors and invented the oil switch and the varnished cambric cable. Mr. Emmet is consulting engineer of the General Electric Company and is in direct charge of the great work now going on in the electric-propulsion and ordnance equipment of the United States superdreadnaught *California.*

American Society of Aeronautic Engineers.

Elmer A. Sperry, who perfected one of the first arc lights in America before he was 20 years old and who today is one of the world's foremost inventors of electrical appliances. He was one of the first to produce electrical mining machinery, electrical street railway cars, electric motor vehicles and gasoline automobiles; he perfected the gyroscopic compass and was the first to produce entirely practical apparatus for the stabilization of ships and aeroplanes.

Electricity in a Wholesale Grocery Establishment.

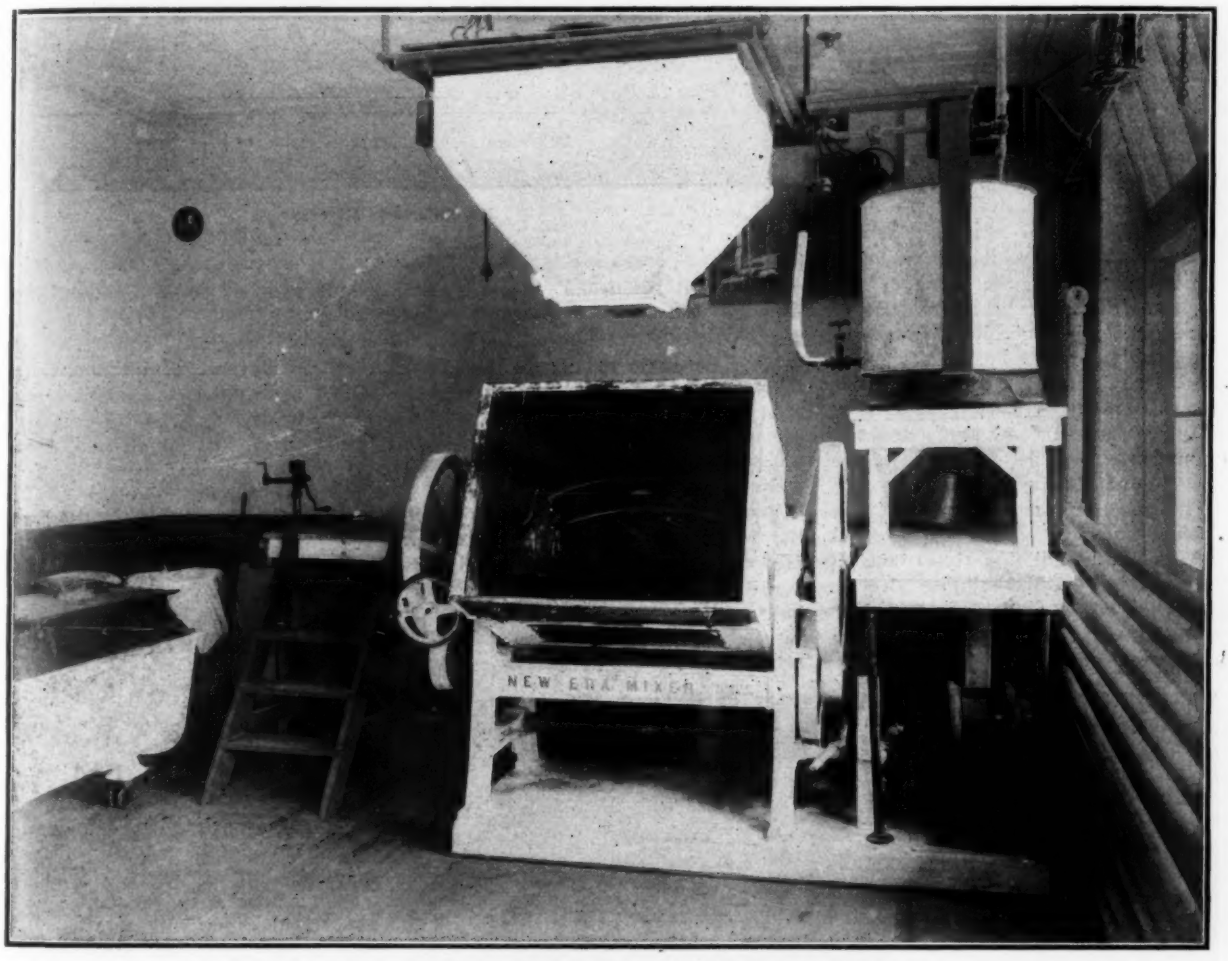
This article treats of the advantages of central-station service for a wholesale grocery establishment which maintains its own bakery and cold-storage facilities for a chain of stores. Details are given as to the electrical equipment in the several individual plants.

What can be done in the way of electrical development in the mercantile business of small cities, when properly pushed by the central station, is well illustrated by the Meaker Food Stores in Auburn, N. Y. The corporation owning the stores operates two main groceries and markets, the Auburn Grocery Company and the Sun Grocery Company, besides five branch stores in various parts of the city. In addition there is a large wholesale grocery, auto-delivery service, and the Sun Baking Company, which has a daily capacity of 10,000 loaves of bread and 2,000 cakes, besides pies, doughnuts and cookies.

The product of the baking company is principally sold by the Food Stores although some wholesaling is done. In all of the establishments the most modern electrical equipments have been installed for light and power, including refrigeration, meat grinders, coffee mills, cash carriers, elevators, call systems, etc. In the bakery the oven temperatures are controlled by electrically-operated thermostats.

The two main stores and the bakery have complete motor-driven refrigerating plants for cooling produce of all kinds. The lighting systems in all departments have received careful attention and are not only artistic, but scientifically effective. Current is supplied by the Empire Gas & Electric Company from its three-phase, 60-cycle system and all motors used by the Meaker corporation are three-phase, 60-cycle, 230-volt machines. It will, therefore, be unnecessary to mention the motor characteristics in the course of this article, which will be devoted principally to the refrigerating systems and the bakery equipment installed.

Before taking up the details of the equipments it may be well to consider some of the advantages offered by electrical devices in this kind of business, using central-station service. Electric lighting has become so generally used in places of business that it is scarcely necessary to enumerate the advantages gained by its use. It is, however, the only lighting that can be used to advantage where low or cool temperatures are maintained, and in refrigeration systems this is important. The illumination of show cases is possible where low temperatures are maintained, as is the case in markets. In bakeries electric light and power has solved the heat question that was formerly so troublesome and has added materially to the hygienic conditions. The "Safety First" question is always to be considered and in bakeries and markets it plays just as important a part as in other lines of business. Electric illumination and electric drive have done much for the safety and comfort of employees as well as greatly



New Era Dough Mixer Driven by 10-Horsepower Motor.

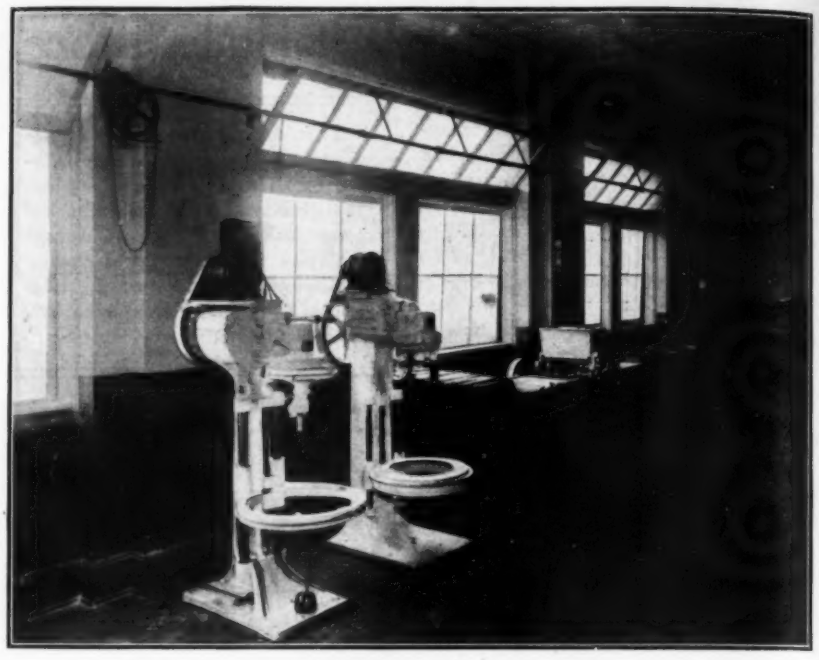
improving the quality of the product. In fact, much of the success of a bakery establishment depends upon uniformity of product which is only possible with electric drive.

Something may be aptly said in regard to the use of private plants in baking establishments. The first cost of motors is considerably less than that of a plant or a steam engine with long lines of shafting, and cumbersome belts which are always liable to dislodge dirt and throw oil that may contaminate the baked goods. The cost of motor maintenance is exceedingly small compared with that of a plant. The capacity of a plant is fixed but where central-station service is used motors may be added at any time and placed where convenience dictates. The reliability of an isolated plant frequently depends upon a single boiler and generating unit and failure of any one part means a shut down. With central-station service this phase of the question need not be considered.

With mechanical drive, to keep down excessive losses in shafting, belting, and gearing the machines must be located to simplify the drive. With electric drive the machines can be placed to facilitate the logical sequence of operations. The entire absence of smoke, noxious gases, and dust makes electric power particularly adapted to all places where food stuffs are sold or made.

Sun Baking Company.

For the accommodation of the Sun Baking Company a three-story brick and concrete building has recently been erected. This building also includes the offices and the garage. Natural light, sanitation, and ventilation have received careful attention and every machine employing power is individually driven by an electric motor. The top floor is used for the storage of flour which is elevated by one of three electric elevators. On this floor is located a Read Machine Company flour sifter with a capacity of over 10,000 loaves of bread daily. It is driven by a five-horsepower motor with gear connections.



Motor-Driven Mixers.

From the sifter the flour descends to the floor below into a New Era dough mixer shown in one of the accompanying illustrations. This mixer, as will be seen from the illustration, consists of a sheet metal container which can be tilted, within which are a series of paddles or stirrers. The mixer is driven by a 10-horsepower motor through gearing. From the dough mixer the dough is transferred to a Werner& Pfleinder divider and rounder shown in another of the illustrations, which is driven by a 2.5-horsepower motor. Here the dough is automatically divided into the size of the loaves and formed on the rounder.

Supplementary to this machine there is a Thompson loaf moulder driven by a two-horsepower motor. For mixing the cake dough there is a Read three-speed mixer shown herewith. The illustration shows two such machines but the larger machine has been substituted for the smaller one. The dough container is placed on the machine and the stirrer attached to the vertical shaft. The machine is driven by a one-horsepower motor.

For the preparation of cookies there is a Triumph cooky machine having a capacity of 400-dozen cookies an hour. This machine rolls the dough to the proper thickness, cuts out the cookies and drops them into pans ready for baking. A one-horsepower motor drives this machine by means of gearing.

There is a complete refrigerating plant installed for cooling the perishable ingredients used in the various products of the bakery, which will be described in connection with the other refrigerating plants. This plant is similar to that of the Auburn Grocery Company and the illustration will serve for both outfits.

All of the ovens in the bakery have while-tile fronts and are governed by electrically-operated thermostats. The entire absence of shafts and belting is

Motor-Driven Compressor.

Motor-Driven Elevator.

noticeable to any observer as well as the extreme cleanliness, good lighting, perfect ventilation, the absence of heat and other conditions that tend to make insanitary and unhygienic conditions.

Refrigerating Plants.

To make the description of the refrigerating equipments more comprehensive it may be well to state some of the requirements of refrigerating plants for markets, groceries and bakeries. The dry direct-expansion system is used in all three plants here described. This system, where the ammonia leaves the expansion coil slightly superheated, requires about 33.33 per cent more pipe than a wet compression system in which the ammonia leaves the coils containing enough entrained liquid to maintain a wet compression condition in the compressor. It is, however, more simple than the wet system and is better adapted to small plants.

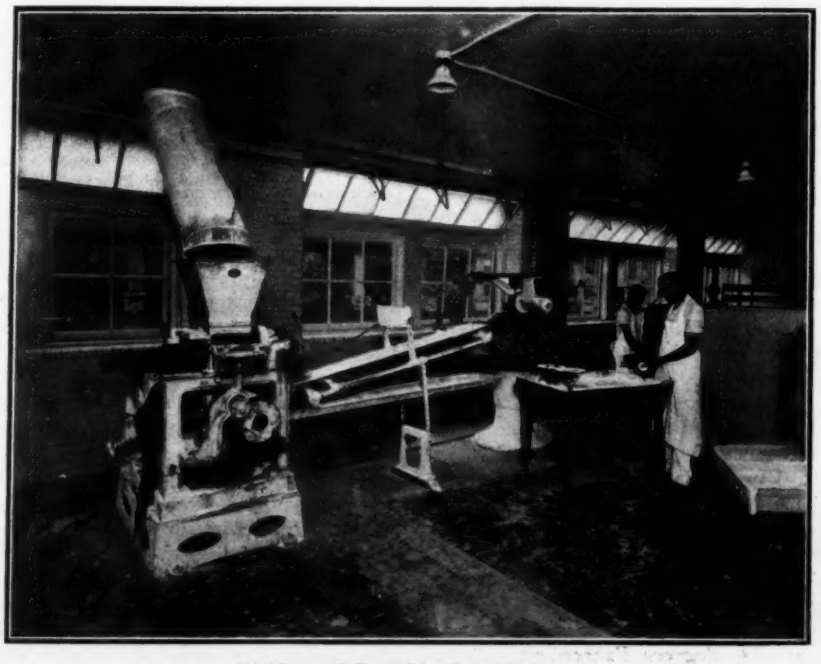
Ammonia is evaporated in the direct-expansion coils from which it returns to the compressor which increases the pressure of the gasified ammonia. An expansion valve controls the liquefied ammonia under condenser pressure as it flows from the receiver to the expansion coil in which a materially lower pressure is maintained in order that the refrigerating medium may boil at a sufficiently low temperature to absorb heat and consequently refrigerate the surrounding air. In the older systems of refrigeration, the condenser used required the external application of water sprays and a circulation of air for cooling. In modern plants the condenser consists of concentrically-arranged pipes, one within the other. The ammonia circulates through the inner pipe and the water between the outer surface of this pipe and the outer pipe casing. With this construction the condenser can be placed in any convenient place and readily adapts itself to electrically operated refrigeration plants.

Cold-storage boxes have various shapes and the consideration of how much refrigeration is necessary depends upon the construction of the boxes or rooms, the heat admitted from opening the doors, from illumination, heat emitted by the goods stored, etc. The insulation of the walls of cold storage rooms is one of the most important items. A good form of construction comprises two strips of wood seven-eighths inch thick, one-inch air space, another seven-eighths wood strip, six inches of granulated cork and finally two wood strips separated by building paper. With such construction the heat transmission in B.t.u.'s is about 0.46 per square foot of surface per degree difference between the inside and the outside temperature. Different commodities require different temperatures and it is necessary to provide means for regulating the temperature. One arrangement consists of two or more direct expansion coils, each controlled by an expansion valve. With this arrangement one coil may be shut off or the circulation of the ammonia controlled in any coil.

The following excerpts are taken from Matthew's "Mechanical Refrigeration" and will serve as a guide to laying out refrigeration plants and to illustrate the reason for adopting the equipments described:

"The total amount of heat that the refrigerating machine must remove from the cold-storage compartment, is made up as follows: Latent and sometimes specific heat of the products stored; heat evolved by lights; heat given off by workmen; heat absorbed in the precipitation and freezing of moisture; heat of air entering through open doors; heat entering through the storage-room insulation.

"The amount of refrigeration required to cool a given amount of food product through a given range in temperature is a practically fixed quantity for a given product, but varies widely with different products. When cooling is not to be carried below the freezing



Divider and Rounder, Motor Driven.

point the amount of refrigeration required may be found by multiplying the specific heat of the product by the number of degrees through which it is to be cooled. If the product is also to be frozen, this amount of refrigeration must be increased by the amount of the latent heat of fusion, and if cooling is to be continued below the freezing point, the refrigeration must be further increased by the specific heat of the product below 32 degrees multiplied by the number of degrees through which it is cooled below the freezing point. The specific and latent heat of a number of products commonly preserved in cold storage are given in Table I.

TABLE I.
Properties of Food Products (Matthews).

Product.	Specific heat above 32 deg. F.	Latent heat of freezing.	Specific heat below 32 deg. F.
Beef, lean...	0.77	102	0.41
Beef, fat....	0.60	72	0.34
Butter	0.64	...	0.84
Cream	0.68	84	0.38
Eggs	0.76	100	0.40
Fish	0.82	111	0.43
Milk	0.90	124	0.47
Mutton	0.67	...	0.84
Oysters	0.84	114	0.44
Poultry	0.80	105	0.42
Pork-fat	0.51	55	0.30

"Example.—It is required to cool 10,000 pounds of freshly cooled poultry through 68 degrees Fahrenheit. The specific heat as given in the table is 0.80. The number of British thermal units to be removed will be 0.80 times 10,000 times 68 which equals 544,000. Dividing this result by 144 (number of British thermal units per pound of refrigeration), the amount of cooling duty is found to be 3,777.7 pounds. If the poultry is frozen, the additional refrigeration required will be 10,000 times 105, which equals 1,050,000 British thermal units or 7,292 pounds, and if additional cooling to zero degrees Fahrenheit is required, the additional cold will be 10,000 times 0.42 times 32 which equals 134,000 British thermal units or 933.3 pounds. The total refrigeration duty to cool the products through 68 degrees Fahrenheit, freeze it at 32 degrees Fahrenheit and then chill it to zero degrees Fahrenheit, would be 3,777.7 plus 7,292 plus 933.3, which equals 12,003 pounds, or dividing by 2,000 (pounds per ton), six tons."

Table II is used for estimating the amount of refrigeration required to chill beef, pork, and sausage, through 64 degrees Fahrenheit or from 104 degrees Fahrenheit to 40 degrees Fahrenheit.

The refrigeration plant in the Sun Baking Company's building comprises a Brunswick five-ton, Type CC4 vertical two-cylinder ammonia compressor belted to a 10-horsepower motor. This supplies refrigeration to three store rooms 18 by 12 by 8 feet, for butter, lard, flour, eggs, etc., and a smaller cooler for cream. The average temperature maintained in all of the coolers is 40 degrees Fahrenheit. The refrigerating plant of the Auburn Grocery Company so far as the motor and compressor are concerned are duplicates. The arrangement for cooling the display counters for perishable goods is novel and possesses numerous advantages. The meat and fish counters are 80 feet long and 3 feet wide, the cheese and perishable goods counter 28 feet long and 3 feet wide. At the back of the counters there is a four-pipe ammonia coil extending the full length. The front above the

TABLE II.
Refrigeration to Cool Meats (Matthews).

Products.	Poultry.	Beef, fat.	Beef, medium.	Beef, lean.	Pork, fat.	Sausage, 15 % water.
Specific heat.....	0.80	0.60	0.68	0.77	0.51	0.65
B. t. u. to cool 1,000 lbs. 1 deg. F.....	800	600	680	770	510	650
B. t. u. to cool 1,000 lbs. 64 deg. F.....51,200		38,400	43,520	49,280	32,640	41,600
Pounds refrigeration per 1,000 lbs. (64 deg. F.).....355.55		266.66	302.22	333.66	226.66	288.88
Pounds of meat cooled 64 deg. per ton of refrigeration..... 5,625		7,500	6.615	5,844	8,765	6,923
Average weight, carcass.....		750 lbs.	750 lbs.	750 lbs.	250 lbs.	...
Carcasses cooled per ton.....		10	8.82	7.78	35.3	...

counter level is glass about two feet high with glass extending about two-thirds the distance to the rear side. The temperature maintained around the goods is about 40 degrees Fahrenheit.

The meat cooler is 14 feet square and 8 feet high and is maintained at 32 degrees Fahrenheit. The vegetable cooler is 6 by 15 by 8 feet and is maintained at 34 degrees Fahrenheit. The butter cooler is 5 by 10 by 8 feet and is maintained at a temperature of 40 degrees Fahrenheit. The initial ammonia pressure is kept at approximately 120 pounds with a back pressure of eight pounds.

The refrigerating equipment of the Sun Grocery Company is larger, consisting of a 10-ton York two-cylinder ammonia compressor belted to a 20-horsepower motor. There are seven coolers for meat and groceries in which the temperatures are maintained at from 12 to 33 degrees Fahrenheit. The proportion of the refrigeration capacity to the cubical contents is approximately the same as that of the Auburn Grocery Company's plant. The construction, however, differs somewhat. There are several brine tanks in each storage room through which part of the ammonia expansion coils pass. This lowers the temperature of the brine to that of the room and it is possible to shut down the compressor for several hours at a time with but a slight rise in room temperature.

A tabulated list of motors in the various establishments described is given in Table III.

TABLE III.
Motor Data—Sun Baking Company, Auburn Grocery Company, Sun Grocery Company—3-phase, 230-volt, 60 cycles.

No.	Horse-power	Kind of Drive	Application
			SUN BAKING COMPANY.
1	5	Gears	Read Machine Company's cone flour sifter, 10,000 loaves bread daily.
1	10	Gears	New Era dough mixer, 10,000 loaves bread daily.
1	2.5	Gears	Werner & Pfleiderer divider and rounder.
1	2	Gears	Thomson loaf moulder.
1	1	Gears	Read three-speed dough mixer for cake.
1	1	Gears	Triumph cooky machine, cuts out 100 dozen in 15 minutes.
1	10	Belt	Brunswick five-ton ammonia compressor.
			SUN GROCERY COMPANY.
1	20	Belt	York 20-ton ammonia compressor.
			AUBURN GROCERY COMPANY.
1	10	Belt	Brunswick five-ton ammonia compressor.

NOTE—These data do not include electric elevators and small motor applications such as coffee mills, meat grinders, etc.

Chicago Utilities Send Men to Army Training Camp.

The Commonwealth Edison Company, Public Service Company, of Northern Illinois and the Chicago Telephone Company will each send a quota of employees to the military training camp which is to be held at Fort Sheridan, Ill., September 20 to October 17. In each case the salary and expenses of the men will be paid by the utility.

The Commonwealth Edison Company will send 10 men, who have been selected by a committee of executives of the company, namely, W. A. Fox, vice-president; J. H. Gulick, vice-president; Peter Junkersfeld, assistant to the first vice-president and W. L. Abbott, chief operating engineer. The employees who will attend at the company's expense are: George H. Jones, power engineer; John T. Mountain, operating department; F. N. Savage, operating department; A. P. Thoms, operating department; D. F. Backen, substation department; A. H. Sweetnam, engineering department; B. F. McGuire, statistical department; W. W. Parker, testing department; H. E. Wulfing, street department; and C. W. Bontemps, distribution engineering department.

The Edison Company will also pay half salary and allow time off to any other employees who desire to attend. About 55 employees of the company are members of the Illinois National Guard, and these men are always permitted to attend the annual encampments on full pay without sacrificing their vacations.

Commercial Practice
Management, Rates, New Business

Electrical Features of New Office Building of New Bedford Central Station.

The New Bedford (Mass.) Gas & Edison Light Company has recently occupied its new building, located on the principal business street of the city, near partment stores, banks and public buildings. The structure is of limestone, consists of four stories and basement 80 by 100 feet, with a garage adjoining 70 by 100 feet, and is devoted entirely to the purposes of the business. The cost was about $300,000.

On the first floor are the business offices, the front half being a lobby and show room for domestic appliances. The interior facing is of handsome variegated Italian marble, the baseboards and column bases and heads being of black Egyptian marble. The cashier's cage is of bronze. The floor is four bays wide and five bays deep, with massive columns, and semi-indirect alabaster bowls, each containing four 100-watt Mazda lamps, are centrally located in each bay.

Lamp and Fixture Display Room.

Section of General Office.

Displays of domestic appliances are contained in all-glass cases and consist of a full line of Universal household devices, Simplex and Rogers percolators, and flatirons, water-boilers, toasters, samovars, etc., of various manufactures. Electric ranges of Simplex, Hotpoint, Hughes and Westinghouse manufacture, and Eureka, Eclipse, Brilliant, Western Electric and Frantz-Premier portable vacuum cleaners, and Arco Wand stationary cleaner are on sale. Standard fireless cookers, Hughes portable ovens, General Electric fans and other devices are offered, the large area given to the display being favorable to an adequate showing of the apparatus.

On the second floor, reached by electric passenger elevator or marble stairway, are the manager's and superintendent's offices and a large show room for lamps and fixtures. Electric drop lamps and chandeliers are arranged in ten lines, the units being suspended on wire hooked rods about 2.5 feet long from lines of pipe installed near the ceiling, these inclosing feed wires with connections by flexible cords from two-light Benjamin receptacles, two lights being connected from each outlet. There are 26 lights or chandeliers in each line, with 13 outlets. Switches for their control are located in an oak-framed cabinet located conveniently near, to enable a salesman to switch on the lights desired for exhibition purposes. Lighting of the showroom is by means of the units on exhibition.

The third floor of the building contains an assembly hall with seating capacity of about 275. This room is about 50 by 60 feet, and is lighted by means of nine 300-watt nitrogen-filled lamps in acorn-shaped alabaster bowls. A well equipped kitchen adjoins the hall, for use in preparing suppers and to enable the women employees to prepare their noon lunches.

The hall is used for monthly lectures on technical subjects and for frequent entertainments of the Stetson Club of employees. This club is also provided with a room furnished with billiard tables and other games and magazines, and is open daily for 8 to 11 p. m. Each member pays one dollar a year to meet the janitors expense; the company provides the room and lighting free.

Other rooms on this floor are a ladies' rest rooms and a directors' room, both handsomely finished in mahogany.

The whole fourth floor is the stock room. A three-ton F. S. Payne Company freight elevator with platform 9 by 15 feet, operates between the basement and this floor, with a door leading from the electric garage directly onto its platform. Wagons that carry supplies are run onto the elevator and taken up to the fourth floor, where they are loaded, this method saving one handling. The drum and elevator motors, of 20 horsepower, are located on an iron floor just below the roof. Elevators are run on the company's 550-volt three-phase service.

The electric meter-testing room is provided with two separate boards consisting of three slate panels each. Wires come from the switchboard in the basement through 0.75-inch iron conduit to junction boxes, and the resistance tubes are supported on a framework, above the board, constructed of angle irons on brackets eight inches from the wall. Direct, single-phase and three-phase alternating current are available, from 0.25 to 80 amperes in volume, for testing all meters, and compressed air is provided for blowing out mechanisms and drying paint.

The board was constructed on plans of the lighting company's meter department by the Taunton & New Bedford Copper Company. Three 25-watt Mazda lamps

in close Holophane metal shades light the bench, and a 12-inch fan installed on the angle-iron supports furnishes ventilation.

The electric garage of the New Bedford company is one of the most thoroughly equipped in New England. There are charging stations for 27 vehicles at once, and a repair room with three-eighths-horsepower motored double grinder, an ignition battery of from 0.5 to 30 amperes, in 0.5-ampere steps; an electric vulcanizer, which permits of the repair of tire shoes without removal from the automobile, and a gas stove for heating tallow for lubricating driving chains.

A feature of the garage is a working pit in the floor, 4 by 12 feet and 5 feet deep, with nine 40-watt Mazda lamps, each in a round recess in the walls about one foot below floor level and so located as to shine on the under mechanism of an automobile run over the pit. The bottom is of concrete and the walls are lined with white tiles.

The New Bedford company is a leader in electric vehicle operation and promotion. It has nine cars of its own, of the following makes, with uses appended: A Bailey runabout, for the special use of D. W. Beaman, general superintendent; a Baker runabout, equipped for use in trimming arc street lamps; a 1,000-pound Baker, for carting pipe for the gas department; a 2.5-ton Baker, for hauling poles; a 1,000-pound Detroit, used in installing electric meters; a 1,000-pound General Vehicle truck, for transporting gas stoves; a one-ton G. V., used in installing electric services; a 3.5-ton G. V., to haul coke, and a 1,000-pound Studebaker, used in installing gas meters. In addition, three trucks and nine pleasure cars are charged for private parties, and one of the trucks is garaged here. There are about 45 electric vehicles in the city.

A room containing the board, and office equipment for the vehicle department, is located at the front of the building near the doors, and here is installed a three-phase 550-volt motor-generator set, which provides 15 volts direct current as a booster on the 110-volt central-station circuit. The switchboard for the control of incoming circuits and the charging panels is of Taunton & New Bedford Copper Company manufacture, and the grids are of Cutler-Hammer make.

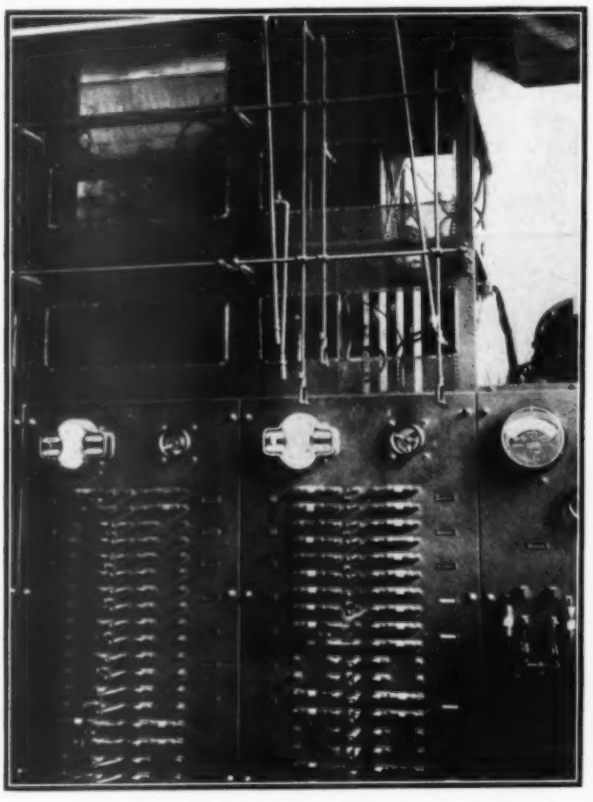
A stock room on a half-floor above is reached by a spiral iron staircase.

The main switchboard for the buildings is located, as noted, in the basement, and consists of four large slate panels, for direct current, single-phase and three-phase alternating circuits. Conduits carrying leads to the upper floors rise from the back of the board, which stands four feet from the wall, and run open along the ceiling, there being six 1.5-inch conduits.

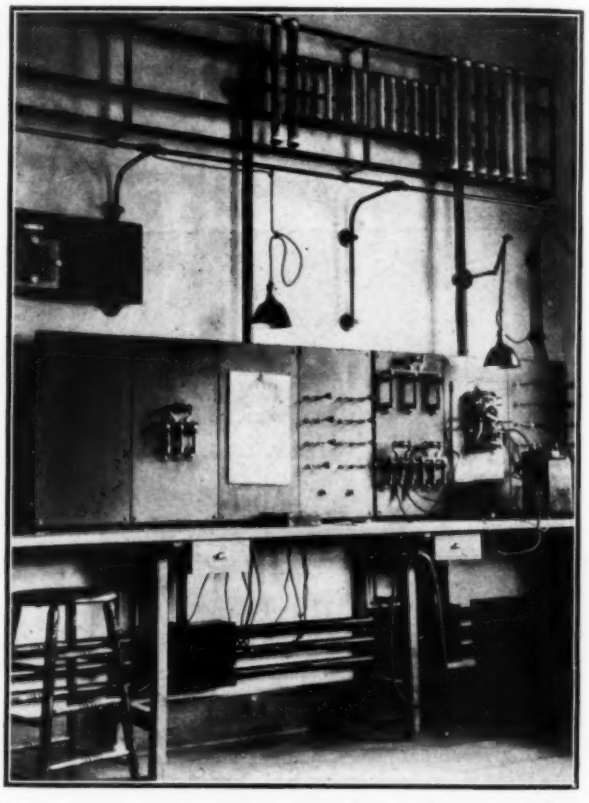
A horizontal angle iron at the back of the board, about five feet above the floor, bonds the conduit and secures alignment. The total capacity of the board, which supplies both the main building and the garage, is about 1,600 amperes.

In the basement is located an Arco Wand vacuum cleaner operated by a two-horsepower motor on 220-volt single-phase service and controlled from each floor by a push-button switch. The air compressor for tire inflation and other purposes is driven by a 2.5-horsepower three-phase motor and is provided with automatic control which keeps the tank at required pressure.

The external lighting of the building is by large translucent balls, attached to the walls by ornamental brackets.



Charging Board in New Bedford Company's Garage.



Meter-Testing Outfit, New Bedford Gas & Electric Company.

Sign Legislation in Clarksville.

Clarksville, Tenn., has made a change in its electric sign ordinance whereby the number of lamps required, in proportion to the surface of the sign, is not specified, as in the old ordinance. The amended measure now states: "And for the purpose of this ordinance an electric sign is hereby declared to be a sign in which all the letters are illuminated on each side of said sign by incandescent lamps of such power as to illuminate thoroughly all the letters on each side of said sign."

Electric Truck for Advertising Cigars.

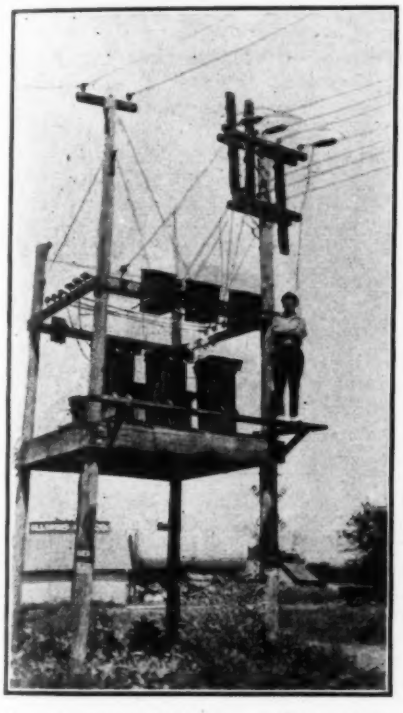
The C. C. Bickel Company, cigar manufacturers of Louisville, Ky., has been advertising its leading brands by means of a motor truck carrying a number of electric signs. The truck has been in Lexington and other towns in the state.

Galva Company Extends Lines.

The Galva (Ill.) Electric Light Company has purchased the electric property at Wataga, Ill., and it will be operated from the central power station at Galva when connected by transmission lines now building. This company, organized two years ago, has bought and dismantled seven electric plants and now supplies nine towns and cities in Henry, Knox and Stark counties.

The power plant at Galva is new, substantial, highly efficient, and amply designed for continuous service for its population of ten thousand. About 700 horsepower in motors are connected.

The accompanying illustration shows the step-down apparatus at Cambridge, having a capacity of 150 kilovolt-amperes, three-phase, four wire. This



Transformer Installation on Galva Line.

station is 18 miles from Galva. E. L. Brown is president, E. O. Brown manager and H. C. Pollitz secretary of the corporation.

Boston Edison Company's Steady Growth.

Figures which show the condition of the Edison Electric Illuminating Company of Boston on June 30, 1915, have been issued by the company, in anticipation of the annual return soon to be filed with the Massachusetts Gas and Electric Light Commission, as required by law.

High records have been established in the number of lamps connected, the horsepower of motors, the gross earnings and the net earnings.

Lamps and motors connected, compared with previous years, were as follows:

	1915	1914	1913	1912
Incandescent lamps	2,508,059	2,245,547	1,972,872	1,766,618
Arc lamps	11,010	12,297	12,039	11,652
Motors, horsepower	116,913	106,205	93,175	78,733
Connected load, in 50-watt equivalents	4,382,856	3,973,881	3,502,925	3,075,783

Energy sold to other companies and municipalities was as follows, in kilowatt-hours:

	1914-15	1913-14	1912-13
Cambridge Electric	8,137	8,115	8,166
Charlestown Electric	2,374,453	2,033,126	1,927,957
Town of Norwood	1,484,000	1,516,000	1,597,600
Town of Wellesley	796,750	639,410	573,970
Town of Wakefield	342,240	....	....

For the first time in the company's history the net earnings exceeded $4,000,000, the exact figures for 1914-15 being $4,002,292, compared with $3,855,016 the year before, or a gain of 3 per cent.

Earnings were equivalent to 14 per cent on the $20,480,000 stock outstanding June 30, compared with the same rate on $20,472,900 the preceding year.

Earnings for the past four fiscal years compare as follows:

	1915	1914	1913	1912
Gross	$7,429,124	$7,008,288	$6,365,874	$5,787,344
Expenses	3,426,832	3,153,271	2,724,198	2,371,563
Net	4,002,292	3,855,016	3,641,675	3,415,780
Misc. profits	118,909	57,134	103,956	74,969
Total net	4,121,201	3,912,150	3,745,631	3,490,750
Taxes	843,450	785,713	797,617	780,000
Balance	3,277,751	3,126,437	2,948,014	2,710,750
Interest	371,474	399,615	390,065	242,859
Dividends	2,457,174	2,252,319	1,950,333	1,872,444
Bal. for deprec. and misc. charges	449,102	474,503	607,616	595,446

The total number of customers is now 72,902, and the population of territory served is over 1,000,000.

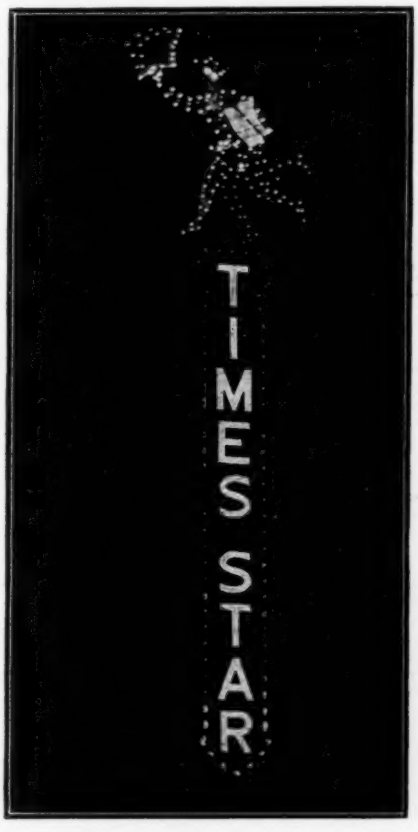
Effective Sign for Newspaper.

Keen appreciation of the value of good advertising is the most natural thing in the world for a newspaper, which itself lives by advertising; and there is therefore nothing surprising in the fact that the Cincinnati *Times-Star*, a leading afternoon daily in that city, has installed one of the most striking electric signs in Cincinnati, for the purpose of making the location of its building conspicuous and getting what publicity there may be in the possession of such a sign.

Something a little out of the ordinary was desired, as a matter of course, in order to serve the purpose desired. The Federal Sign System, (Electric), which was called upon to do the work, considered the job from this angle, and evolved a sign which is eminently characteristic, and which nobody need fail to recognize as one designating a newspaper office. Anybody who can read can see the name, *Times-Star*, outlined at night in letters of fire two feet high, while even those who cannot can hardly overlook the gigantic running newsboy who surmounts the sign, waving a sheet from his bundle of papers.

The sign is placed at the corner of the *Times-Star*, seven-story building at Sixth and Walnut Streets, projecting so as to be visible from all directions; and inasmuch as it is 40 feet high from top to bottom, it can readily be understood that it can be seen from a considerable distance.

On account of presenting both sides to the public view, it is a double-face



New Electric Sign in Cincinnati.

sign; the two faces being identical. The letters are white-enameled porcelain steel, raised from the black background, and standing out plainly in daylight, while the lights in which they are outlined at night make them even more conspicuous. Around the border, which is also painted white, a high-speed waving effect is produced at night by means of flashing lamps.

The figure of the boy on top of the sign is eight feet high, and a motor-driven Reco flasher operates the contacts which produce the running effect, making this sign one of the most striking in Cincinnati. Betts & Betts color-caps are used around the border, to give contrast. There are 1,000 10-watt Mazda lamps in the sign.

Public Service and Rates Discussed by Association of Edison Illuminating Companies.

The report of the Committee on Reporting Decisions of Public Service Commissions, E. W. Burdett, chairman, and the report of the Committee on Residential Service, Alex Dow, chairman, together with a general open discussion on central-station rate-making, engaged the serious attention of the thirty-sixth convention of the Association of Edison Illuminating Companies which was held at Spring Lake Beach, N. J., September 13 to 16, inclusive. While other localities on the Atlantic seaboard were suffering from an extreme heat wave, the weather at Spring Lake was ideal for the holding of the convention. A much enjoyed feature was the presence of Thomas A. Edison and his family.

A paper entitled "Electricity for Everybody, a Complete Canvass of the Boston Edison Territory," by Leavitt L. Edgar, presented some remarkable suggestions with regard to the possibilities of universal electrical service. Reports of the following committees were presented: Meters, O. J. Bushnell, chairman; Electric Plant, R. F. Schuchardt, chairman; Steam Plant, J. W. Porter, chairman; Standards, William C. L. Eglin, chairman; Street Lighting, J. W. Cowles, chairman; Incandescent Lamps, J. W. Lieb, chairman.

The convention, which was presided over by Walter F. Wells, of the Edison Illuminating Company, Brooklyn, N. Y., was the largest held in the history of the Association. The business sessions were conducted in a large tent on the lawn. On Tuesday evening a shore dinner, attended by over 400, was given in the tent and greatly enjoyed. On Wednesday evening addresses were made by Frank A. Vanderlip, president of the National City Bank, of New York, and by Thomas N. McCarter, president of the Public Service Electric Company, Newark, N. J. These addresses dealt with questions relating to administrative, executive and financial topics. Samuel Insull, president of the Commonwealth Edison Company, was to have spoken on this subject, but had to leave.

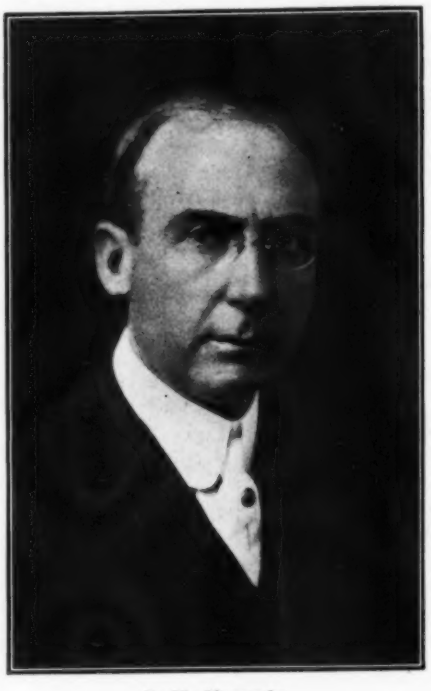
There were many ladies in attendance, for whom there was a special entertainment provided. The leading manufacturing interests were well represented, President E. W. Rice and a large staff from the General Electric Company, and President E. M. Herr and many others from the Westinghouse Electric & Manufacturing Company being present.

The convention concluded on Thursday evening with a dinner to the past presidents, each of whom was presented with a gold badge. The full proceedings of the convention will be given out by the Press Committee.

SUCCESSFUL COMMERCIAL MANAGERS.

Samuel M. Kennedy.

One of the best known men in the electrical industry on the Pacific Coast is Samuel Macaw Kennedy, general agent of the Southern California Edison Company. No greater tribute can be paid Mr. Kennedy as a central-station executive than a reference to the astonishing commercial growth of the company since his connection with it. Since 1903, when he was placed in charge of the commercial activities of the company, the business has increased over 600 per cent and the annual load-factor has been raised from 30 per cent to over 61 per cent.



S. M. Kennedy,
General Agent, Southern California Edison Company.

Mr. Kennedy was born in Toronto, Can., and was educated in the Model School, Collegiate Institute and Upper Canada College, in that city. After leaving college he entered his father's business, and began studying the problems of the wholesale importer of foreign products. In due course he was appointed one of the firm's foreign buyers, and for ten years made frequent trips to and from Europe, crossing the Atlantic forty-two times before he had completed his thirtieth year. During the latter portion of this period he had entire charge of the European end of the business, and made regular visits to the manufacturing centers of Great Britain, France, Switzerland, Germany and Austria. Primarily, as the result of a sunstroke, his health broke down, and for five years he traveled in search of a congenial climate, eventually going to California, where he regained his strength.

In 1901 he became identified with the electrical business, as assistant to the president of the United Electric Gas & Power Company, which company was absorbed in 1903 by the Southern California Edison Company. Since that date Mr. Kennedy has acted as general agent of the Edison Company, and has guided the commercial end of the corporation's growing business. During this period he has seen the volume of his company's business increase 600 per cent and by scientific load building has helped the annual load-factor to climb from approximately 30 per cent to over 61 per cent. Mr. Kennedy has given special attention to the question of "Rates for Service," "Public Relations," and "Business Development," and has contributed a number of valuable articles on these subjects to technical periodicals.

Mr. Kennedy is also a director of Santa Barbara Gas & Electric Company, the Long Beach Consolidated Gas Company and the Santa Barbara & Suburban Railway.

Stimulating Friendly Relations by Sale of Baby Bonds.

A net income of five per cent is the inducement offered by the Oklahoma Gas & Electric Company for the purchase of all baby bonds in denomination of $5.00 and this opportunity to its patrons is being accepted as an easy way for wage earners and persons of moderate means to invest in securities.

This baby-bond specialty was inaugurated by Henry Willmering, chief accountant, Oklahoma Gas & Electric Company, whose keen insight forecasted the plan of popularizing the company by teaching its patrons how to invest their money safely in bonds that are free from income tax and at the same time protect the company against loss through failure of patrons to pay their bills.

These baby bonds, with interest-bearing coupons attached, have revolutionized the system of interest paying heretofore in vogue and likely will be adopted throughout the country by public utilities whose patrons enjoy a return upon their meter deposits.

The process, in its present simplified form, may be stated briefly as follows: The certificates are issued in denomination of $5.00 with attached coupons covering a period of nine years from date of issuance which is indicated by stamp both on face of certificate and upon the back of the first coupon.

On July 1 of each year, or during the month, these coupons, properly indorsed, are presented at the cashier's window and are redeemed by paying the consumer either the cash or by applying the interest upon current bills. The date upon the back of the first coupon indicates whether it is good for a year or fractional part thereof, all chance of error having been eliminated. After payment is made, the value of the coupon is written plainly across the face of the coupon and the date of payment is stamped upon the back.

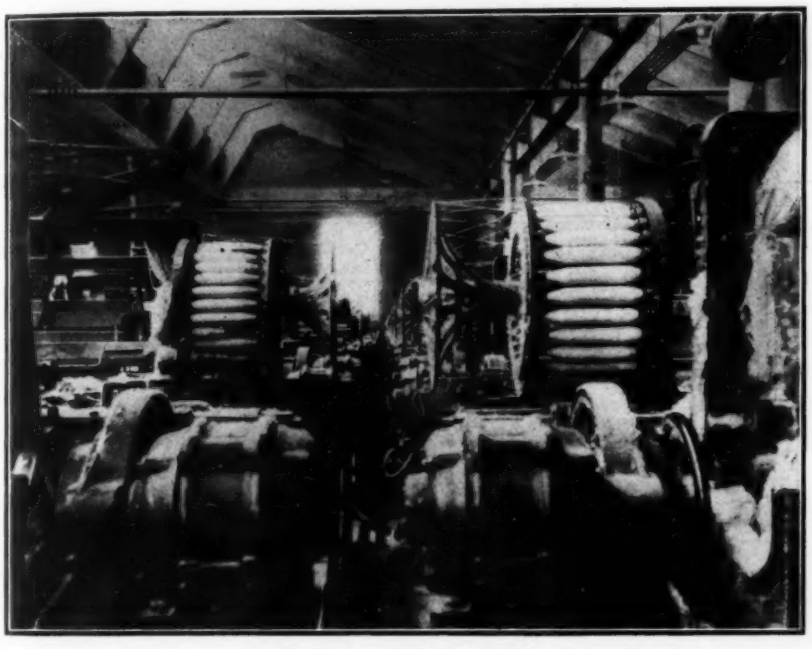
The coupons redeemed each day are sent to the deposit certificate clerk, who duly records the serial number and amount of coupon opposite the corresponding certificate, thereby eliminating all chance of paying the interest twice. After passing through the proper channels, the coupons are filed numerically and reference can be had in a moment's notice.

The willingness with which consumers accept this baby bond and the continually favorable comment on the five-per-cent feature, naturally lead one to the belief that a very troublesome problem has been solved. Before the advent of the coupon bond, thousands of post cards had to be made up annually, showing amount and number of deposit and interest due, then checked against the deposit records and consumers' ledgers and finally mailed to the patron.

This process involved weeks of night work and great confusion attended and much strife resulted from big rushes at the office where much delay naturally followed when all could not be served promptly. The old certificate called for a payment annually of five per cent but the consumer evidently did not read the certificate or consider the interest item.

All utility men are aware how vital is the subject of public relations and this baby-bond feature has proved to be a wonderful factor in producing a broad wholesome smile as the consumer walks up to the cashier and receives a bonus from the gas and electric company.

Patrons walk away from the contract department, examining and reading this new document that represents their bond holdings with the company and they are interested. It is an innovation—it smacks of progress—forward movement. And the public is impressed.



Motor-Driven Looms in Cotton Mill.

New Cotton Mill to Use Central-Station Power.

The extensive plant of the Naunkeag Steam Cotton Company, now in process of construction at Salem, Mass., will be equipped throughout with electrically operated machinery, operated with power obtained from the Salem Electric Lighting Company. The former mills of the company, with the single exception of a concrete storehouse, were entirely destroyed in the conflagration of June 25, 1914.

Already the weave shed, a one-story saw-tooth roofed structure, covering about seven acres, is finished and about 1,200 looms are being operated. The total capacity of the shed is 2,600 looms, and these will be all installed this year. Each of the looms is individually motored, those weaving pillow-case tubing being driven by one-half horsepower motors, and those weaving sheeting by three-quarter horsepower units. All the motors thus far installed are of the induction type, and operate on 220 volts alternating current, the tubing loom motors at 1,200 revolutions per minute and those driving the sheeting looms at 1,800 revolutions per minute.

Each motor is geared to its loom, and the looms are arranged in double lines with the motors on both groups of looms adjacent to each other as shown in the accompanying illustration.

Energy is received from the central station at 2,300 volts, 60 cycles, three-phase, through 1,500 feet of underground conduit. Two transformer vaults are located in the basement of the weave shed, and here are installed three 200-kilovolt-ampere and two 100-kilovolt-ampere transformers rated 2,300/220 volts and three 30-kilowatt 110-volt lighting transformers.

From the transformer rooms the power leads pass to distributing panels, in a corridor outside, which are strongly inclosed in grating. Thence the circuits are carried through the concrete floor, connecting with the switch boxes above through porcelain fittings and J. C. Phelps caplets.

In the basement of the weave shed is located a 125-horsepower motor operating an Ingersoll-Rand double compressor connected with an air tank receiver rated at 100-pounds pressure, which operates humidifiers in the mill.

The weave shed is lighted by 150-watt Mazda lamps installed in 18-inch Wheeler enameled reflectors in 24-foot bays, 14 feet on centers.

New buildings under construction are a four-story carding and ring spinning mill and a five-story cotton storehouse, the latter to be equipped with motor-driven elevators and blowers. Electricity used in these buildings will be three-phase, 60-cycle energy at 550 volts pressure.

A transformer station having a concrete floor and roof and grated sides is under construction in front of the spinning mill. This station will contain four transformers.

Opening of Commonwealth Edison New Quarters.

During the week of September 20, the Commonwealth Edison Company, Chicago, will hold an opening of its new service headquarters and electric shop, located in the new Edison Building. Invitations have been sent to all of the company's customers, and arrangements are being made to accommodate a large number of visitors. Music, motion-pictures and many other special features will be provided.

Electrical Construction

LIGHTNING-ARRESTER INSTALLATION.

By Terrell Croft.

A lightning arrester is a device which offers a path to ground of little opposition to lightning-discharge or other static-disturbance currents, but which at the same time prevents the flow of currents impelled by the normal voltage of the circuit to which it is connected. It should be understood that a lightning arrester does not necessarily "arrest" lightning. The protection afforded is not infallible, but does, with standard makes of lightning arresters, greatly decrease the risk of lightning damage. The installation of lightning arresters is then, in a sense, a species of insurance.

The principle of the lightning arrester is that it constitutes a "short-circuit" route from the line wires to ground for the static-disturbance current. It also affords a course to ground of great opposition to the currents normally circulating in the line. Usually lightning arresters comprise air gaps, or films of chemical compounds connected between the line and ground across which the very-high-voltage, very-high-frequency, lightning discharge currents jump or arc with comparative ease. In some kinds of lightning arresters there is a tendency for the arc, which may be formed when the discharge current jumps across the gap, to continue, due to the normal electromotive force of the generator serving the line. Where this condition is liable to occur, provisions, which would require more extended description than can be given here, must be made to prevent it.

A lightning arrester should be placed on every wire entering a station, because it is impossible to predict with accuracy just where the lightning may "strike." It may strike a long line and not affect a short one, and *vice versa*. It is apparent then that if maximum insurance is to be provided, there should be an arrester on each line near its entrance into the building.

In locating station lightning arresters it is obvious that they should be placed as close as possible to where the wires protected enter the building, so that the danger to the wiring in the building not provided with lightning protection will be minimum. There is frequently formed, particularly with arresters of certain types, a destructive and vicious arc when a lightning current passes to ground through an arrester, and it is for this reason that inflammable materials should not be permitted to remain near an arrester. Fig. 1 shows diagrammatically a typical lightning-arrester installation. Only one wire of the circuit is indicated, but all of the wires of the circuit should be protected as shown.

The lead connecting a lightning arrester between the line and ground should be as straight as possible, because curves, bends or twists may introduce exceedingly great reactance to the lightning-discharge currents in the circuit. For example, the lead *AC*, Fig. 1, to ground is shown as straight as it is possible to make it. Obviously, therefore, lightning arresters should not be mounted on switchboards, but should be independent thereof, and, as suggested in a preceding paragraph, located as close as possible to the point where the conductors enter the building.

The importance of effective ground connections for lightning arresters can scarcely be overestimated, because experience has shown that the condition of the ground or earth connection may largely determine the effectiveness of a lightning-protection equipment.

The ground lead, that is, the conductor or wire, for example, *AC* or *ACD*, Fig. 1, in which the arrester is connected between the line and ground, may from a theoretical standpoint be of practically any reasonable cross-section, or of practically any material. However, since all other metals are either too expensive or corrode too readily, copper is the only material that should be used for ground wires in central stations. Galvanized-iron wire has been used in some cases for ground wires on pole lines, but it has the disadvantage that it is liable to rust asunder at the surface of the ground. Theoretically, the greater the exposed surface of a conductor for a given cross-section, the better carrier it should be for lightning-discharge currents. It follows, therefore, that metal straps or

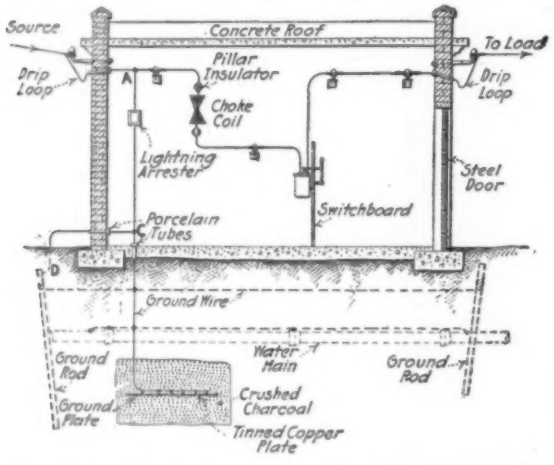


Fig. 1.—Switching Station With Well Arranged Arrester Installation.

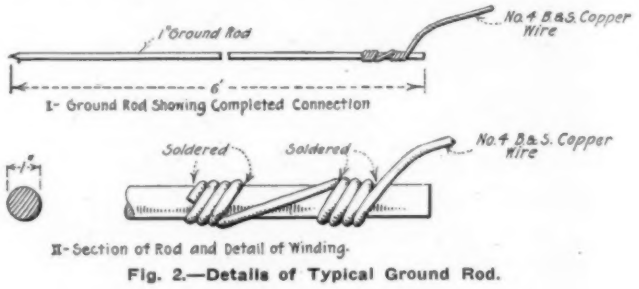

No. 4 B. & S. Copper Wire
1" Ground Rod
6'
I- Ground Rod Showing Completed Connection
Soldered
Soldered
No. 4 B. & S. Copper Wire
II- Section of Rod and Detail of Winding.

Fig. 2.—Details of Typical Ground Rod.

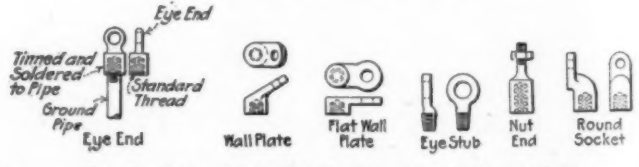


Fig. 3.—Galvanized Fittings for Ground Connections.

tubing (see following paragraph) are better, theoretically, than round wire for this purpose. However, experience has shown that round copper wire, provided it is not too small, will usually answer all requirements. A copper wire smaller than No. 6 should never be used, because this size provides the minimum mechanical strength and conductivity advisable. It is better to use larger ground wires, particularly in important installations. In many cases a ground lead of No. 0 wire is used. This would be equivalent to a copper strap one-eighth by twenty-one thirty-seconds inch (approximately). Ground leads of drawn copper tubing are used to a considerable extent in important installations. Since skin effect is very pronounced in a conductor carrying a high-frequency lightning-discharge current, the metal at or near the center of a solid cylindrical conductor is ineffective in conveying the current. It follows that instead of using solid conductors, it is better for this purpose to use tubular conductors so that the maximum amount of metal in the conductor will be effective. Furthermore, the tubular conductor has the advantage of being stiffer with a given weight of metal than a solid one.

Earth connections or connections to ground are usually made by connecting the ground lead to (1) a water pipe, Fig. 4, (2) a pipe driven into the ground, Fig. 5, (3) a round metal rod or stake driven into the ground, Fig. 2, or (4) a copper plate buried in permanently damp earth, or in a prepared bed, Fig. 6. Frequently effective ground connections can be made by joining the ground lead to flumes, penstocks, or the steel rails of a railroad system.

To make a ground connection on a water pipe, a special brass plug, Fig. 7, is screwed, as illustrated in Fig. 4, into a fitting in the water pipe, as shown at *A*, or into a hole drilled and tapped into the water pipe itself, as at *B*. It is obviously desirable to make the connection in the water main as at *B*, where possible, but where this is not feasible it may be made in a service pipe which leads directly to the water main, as shown at *A*. The connection should always be made on the street side of the water meter. This provides probably the best and most effective ground connection where an extensive pipe system is available. In important installations, such as the ground connection for a central station, the ground lead should be connected to the piping system at several different points.

The pipe earth connection (Fig. 5) is made by driving a piece of wrought-iron pipe into the ground to such a depth that its lower portion will lie in permanently moist soil. The pipe connection offers the cheapest method of making a ground, where it is not possible to connect to a water-piping system. At the same time, experience has shown that pipe ground connections are very effective if properly installed. Galvanized wrought-iron conduit can be used instead of pipe for making grounds of this character.

The methods of connecting the ground lead to the ground pipe are shown in Figs. 8 to 11. The simplest method of effecting a connection is shown in Fig. 8, wherein the copper ground lead is twisted around the ground pipe and soldered thereto. The portion of the pipe where the lead connects, and the lead itself, must be thoroughly tinned prior to the soldering to prevent any possibility of electrolytic action. Sal ammoniac can be used for a flux for tinning the iron pipe, which should be filed clean and bright before the solder is applied.

The method of connecting a ground strap to a ground pipe is shown in Fig. 9. The strap is wedged within the pipe by a metal plug driven in the orifice. Then the plug, pipe and strap are soldered together.

The ground lead can be connected to a pipe by means of a plate clamped between a couple of locknuts on the threaded end of a pipe as shown in the of Figs. 10 and 11. Where the space is restricted it may be necessary to bend down the connecting plate as shown in Fig. 10, but under ordinary conditions it may be permitted to extend, as shown in Fig. 11. The terminal lug placed on the end of the ground lead provides an effective method of connection between the ground lead and the plate and permits the disconnection of the lead if such may be necessary for testing. All metallic parts that are thus in contact at the top of a ground pipe should be tinned to prevent electrolytic action.

Galvanized awning fittings may be used in making ground connections. Some of these standard fittings are shown in Fig. 3. They can be readily procured of galvanized iron and in special cases provide convenient attachment lugs.

The distance to which to drive a ground pipe is determined to some extent by local conditions. The pipe should always go down far enough that its greater portion will always lie in permanently moist earth. As a general rule, a ground rod should be

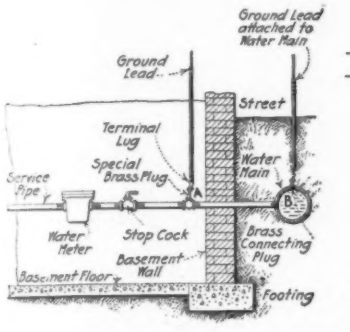


Fig. 4.—Ground Connection to Water Pipes.

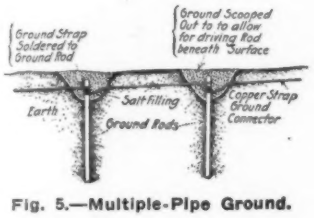

Ground Strap Soldered to Ground Rod
Ground Scooped Out to to allow for driving Rod beneath Surface
Earth
Salt Filling
Ground Rods
Copper Strap Ground Connector

Fig. 5.—Multiple-Pipe Ground.

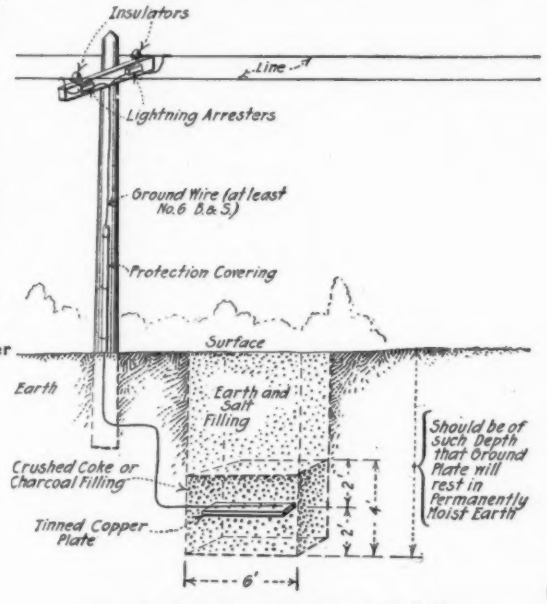


Fig. 6.—Pole-Line Arrester Installation.

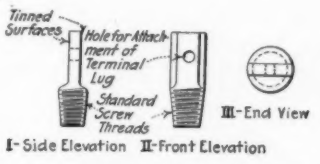


Fig. 7.—Brass Plug for Ground.

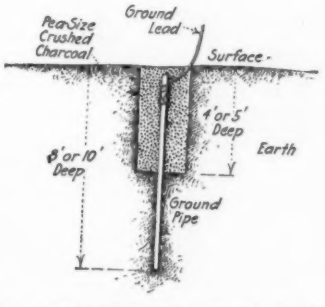


Fig. 8.—Ground Rod With Carbon Packing.

driven at least 6 or 8 feet into the earth and a greater depth is often desirable.

A ground rod or pipe should not be permitted to vibrate while it is being driven. If it does vibrate, it forces away the earth that surrounds it, leaving an air space between the metal and the surrounding soil, as shown in Fig. 12, greatly increasing the resistance of the ground contact offered by the rod or pipe. This difficulty is most likely to occur where the soil is moist.

The earth around a ground rod should always be tamped after a rod has been driven, to correct for the vibration difficulties described above and to make the surrounding soil contact closely with the rod. That tamping will materially decrease the resistance of a ground is evident from tests. The resistance of the earth connection afforded by a ground rod may be 20 to 40 times more before tamping than after.

The methods of improving the conductivity of pipe or rod earth connections are illustrated in Figs. 8 and 10. In Fig. 8 is shown a method described in The Factory Mutual Fire Insurance Rules in rule 5*c*, which consists in digging a hole 4 or 5 feet deep around the ground rod, and filling it with crushed coke or charcoal about pea size. This is said to compensate in a measure for the lack of moisture that may sometimes be encountered. In Fig. 10 salt is packed around the upper end of the ground rod and water is poured on the salt. The salt solution percolates down through the soil around the rod, increasing the conductivity of the adjacent soil. This has the effect of increasing the contact area of the ground rod with the soil and decreases the resistance of the earth connection. The salt should never be permitted to come high enough that it will attack the point of connection between the ground lead and the pipe. Tests have shown that the resistances of pipe earth connections can be very materially lowered by the application of a salt-and-water solution as above described.

A multiple or distributive pipe ground connection is installed where it is desired to obtain an earth connection of minimum resistance. It consists of a number of individual pipe grounds connected in multiple. Obviously the resistance of two pipe earth connections in multiple is less than the resistance of one connection and it follows that the greater the number of pipes connected in multiple, within reasonable limits, the less will be their combined resistance.

Fig. 13 shows an example of a multiple connection where 12 pipes driven into the ground around a station are all connected in multiple by a lead wire, encircling the building under the surface. The connections between the various pipe units may be made by using special connectors like those of Figs. 3 or 11, or a ground wire may be soldered to the tops of the different pipes as shown in Fig. 5. The portions of the pipes adjacent to the copper ground lead should be thoroughly tinned, as should the ground lead itself, to prevent electrolytic action between dissimilar metals.

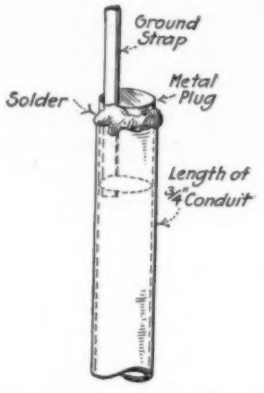


Fig. 9.—Method of Connecting Ground Strap to Ground Pipe.

The resistance of a pipe earth connection varies about inversely as the depth of the pipe in the conducting stratum. Practically all of the resistance of the connection is in the immediate vicinity of the pipe. When preparing multiple-pipe grounds no two pipes of the system should be located closer together than 6 feet. Where the pipes are thus spaced the combined resistance of a multiple-pipe ground will vary inversely as the number of pipes composing it, that is, a two-pipe earth connection will have one-half the resistance of a one-pipe connection, and eight pipes will have one-eighth the resistance of one pipe. The diameter of the pipe has, within reasonable limits, little effect. A good earth connection made by driving one pipe into the ground should have a resistance of less than 20 ohms.

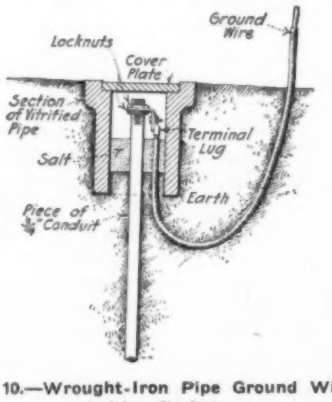


Fig. 10.—Wrought-Iron Pipe Ground With Salting Pocket.

The size of pipe or rod to use for making grounds is a quantity that admits of no absolute determination. The rod or pipe must always be large enough to insure ample mechanical strength and so that it will not vibrate excessively while it is being driven.

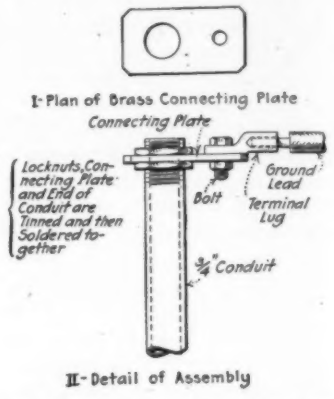

I- Plan of Brass Connecting Plate
Connecting Plate
Locknuts, Connecting Plate and End of Conduit are Tinned and then Soldered together
Bolt
Ground Lead Terminal Lug
¾" Conduit
II- Detail of Assembly

Fig. 11.—Connecting to Ground Pipe Where Lead Taps Off Horizontally.

A one-inch wrought-iron pipe is usually satisfactory. In important installations, two-inch pipe may be used.

Ground rods, Fig. 2, are sometimes used instead of ground pipes. They find their principal application for grounds for telephone and other small lightning arresters. These ground rods are usually about 6 feet long and 0.5 inch in diameter and therefore are not sufficiently heavy for ordinary electric light or power work. The conditions affecting their installation are essentially the same as those described in connection with the ground pipes as outlined in the preceding paragraph. It is obvious that a ground pipe will, for a given amount of material, be longer and stronger than a solid rod. This is the reason why pipes are used more frequently than solid rods.

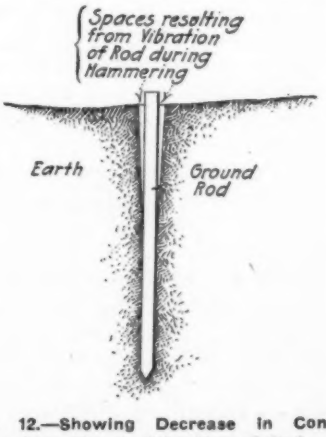


Fig. 12.—Showing Decrease in Contact Area Due to Vibration of Rod.

The ground-plate method of connection is now probably the most infrequently applied of all, it having been superseded to a large extent by the ground-pipe method. Typical ground-

plate installations are shown in Figs. 1 and 6. Detailed instructions for making the ground-plate grounds are given in rule 15g in the National Electrical Code. The ground plate should always, if possible, be buried in permanently moist soil. Where it is possible to install it in the earth under the bank of a stream that never runs dry, the ideal condition will be attained. Merely sinking a metallic plate in the bed of a stream, particularly if it has a rocky bottom and if the water in the stream is pure, will not necessarily make a good ground connection. Pure water, contrary to the general belief, has a very high resistance. However, if this water is combined with metallic salts that usually are in solution in the earth the conductivity of the combination is good. While a metallic ground plate buried in crushed coke or charcoal, Fig. 6, may have a better conductivity than the ground afforded by a single pipe driven into the earth, it is probable that a multiple-pipe connection, Fig. 13, affords a better ground than one ground plate.

A charcoal or coke bed for a ground plate has the effect of increasing the area of the plate in contact with the earth because the carbon is a good conductor and the granulated carbon also acts somewhat like a sponge, in that it retains moisture and tends to keep the adjacent earth in a damp condition, thereby rendering its conductivity a maximum.

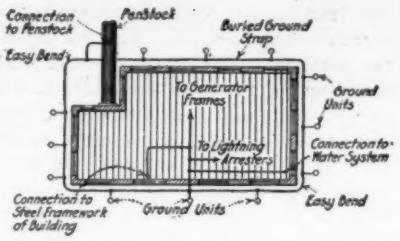


Fig. 13.—Multiple-Pipe Ground Installation.

The method of making a plate ground is shown in Fig. 6. A hole is excavated as near as possible to the location where the ground connection is to be made. Ordinarily the excavation should be about 6 feet long, 4 feet wide, and deep enough to insure to a reasonable certainty that its bottom will always lie in a permanently moist strata. Usually such holes should be 8 or 10 feet deep. The bottom of the hole is filled with a two-foot layer of crushed charcoal, or pea coke well tamped. The ground plate is then placed on this filler and covered with another two-foot layer of the granulated carbon. This layer should also be tamped. The excavation is backfilled to the surface with earth. If common salt (sodium chloride) is mixed with the back filling, the conductivity of the earth will be increased. However, the salt will in time dissolve and soak away into the earth. If the conductivity of the soil at the location where the ground is made is poor, provision should be made somewhat as suggested in Fig. 10, whereby the salt can be replenished and the high conductivity of the soil continuously maintained.

Ground plates are shown in Figs. 6 and 16. The plates are usually made of No. 14 or 16 gauge sheet copper. Ribbed cast-iron plates are, however, quite satisfactory. (See note following rule 15g of the National Electrical Code.) Sheet-iron plates should be avoided because the ordinary commer-

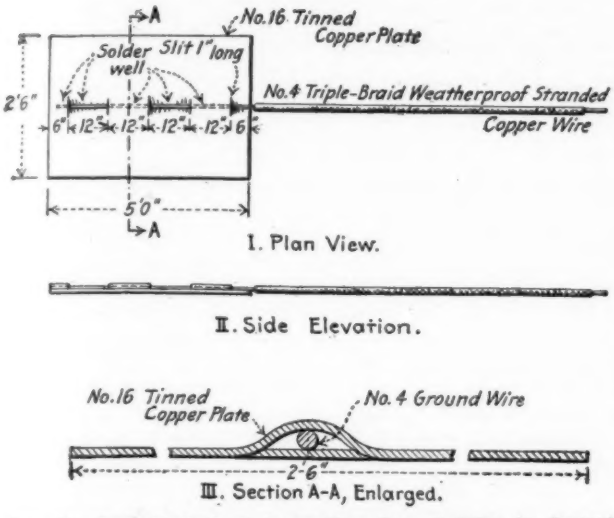


Fig. 14.—Best Method of Connecting Ground Wire to Ground Plate.

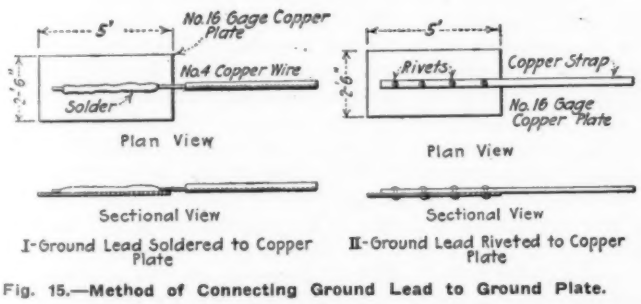


Fig. 15.—Method of Connecting Ground Lead to Ground Plate.

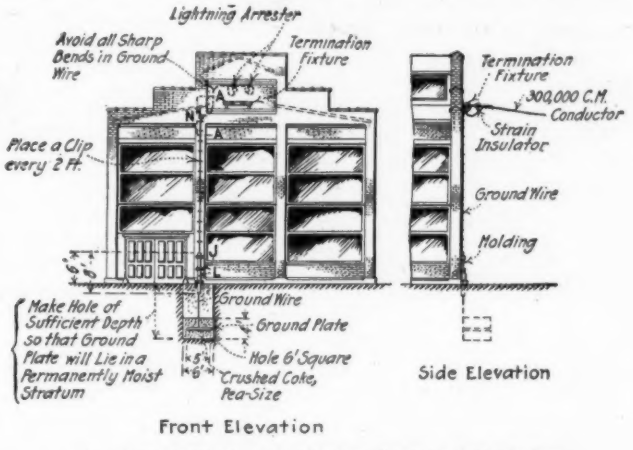


Fig. 17.—Assembly of Lightning-Arrester Installation.

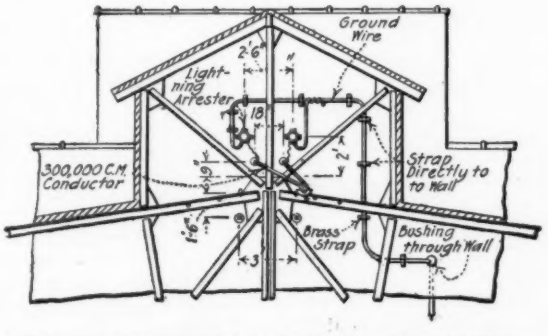


Fig. 18.—Arrangement of Arresters Inside Building.

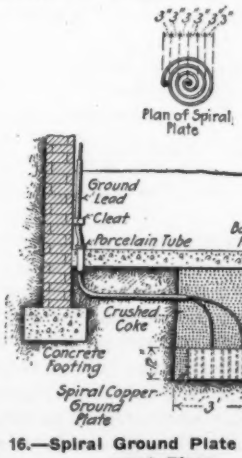


Fig. 16.—Spiral Ground Plate Under Basement Floor.

cial "sheet iron" is usually sheet steel and will corrode rapidly and waste away entirely. A ground plate should have an area on each surface of about 10 or 12 square feet, that is, a total superficial area of about 20 to 24 square feet.

The methods of connecting the ground leads to ground plates are shown in Figs. 14 and 15. In Fig. 14 slots about one inch long are punched through the plate across its center line. The end of the ground wire where it has been previously stripped of its insulation and tinned is threaded through the slots as shown and is then soldered to the plate. Both surfaces of the plate should be well tinned. The method just described is probably the best one for connecting a lead to a ground plate. The lead can be soldered to the upper face of the ground plate as shown in Fig. 15, I. Where a copper strap is used for a ground lead. it can be riveted to the plate and then soldered as shown in Fig. 15, II.

A spiral sheet copper ground plate is shown in Fig. 16. Ground plates of

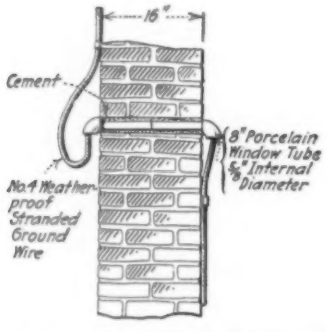


Fig. 20.—Porcelain Tubes Used to Protect Ground Wires.

this type have been employed to a certain extent by the telephone companies in the East, where it was desired to secure large superficial contact area within a small space. These spiral plates are usually bedded in crushed coke or charcoal, unless the earth in which they are installed is very damp.

A complete lightning-arrester system and ground connection for a 250-volt industrial plant is shown in Fig. 17. The ground wire connecting the two arresters is carried down inside of the building, Fig. 18, to a point *N*, Fig. 17, where it is brought through the wall and led down the outside of the building to the ground plate. The ground wire is clamped to its supporting surface by brass clips spaced two feet between centers down to a point within six feet from the sidewalk level. From this point it is carried to a point two feet below the sidewalk level in wooden molding, Fig. 19. The function of the molding is to prevent the accidental contact of pedestrians with the ground wire, which may, under certain conditions, become charged and thereby endanger life. Fig. 20 details the method whereby the ground lead was carried through the wall at the point *N*. Insulation of the ground lead from the wall is, of course, not necessary at this point, but the porcelain tubes were used to prevent moisture from entering around the lead, and to give the wire an "official" appearance

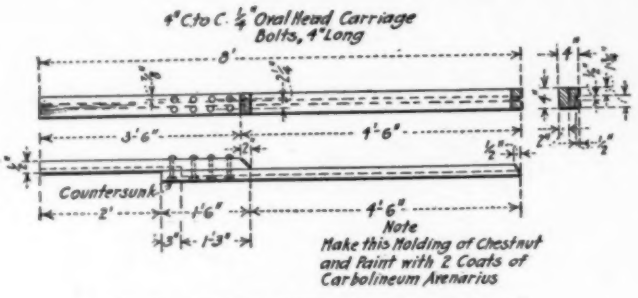


Fig. 19.—Wooden Molding for Ground Wire.

to prevent interference from unauthorized persons.

Lightning arresters on pole lines should, on low-potential lines, be installed about as shown in Fig. 6. In localities subject to lightning disturbances it pays to locate arresters not only at the station but at numerous points along the line. The function of these line lightning arresters is to protect the transformers, if there are such, and the service wires to the buildings and to discharge the line. It is considered good practice to place the arresters at intervals along the line of from 1,500 to 2,000 feet, more or less. Where an overhead line joins an underground cable, an arrester should be located at the junction. It is desirable to place line arresters at points where several overhead lines join, because then a discharge intercepted by any one of the lines may reach ground through the arrester.

It is claimed by some that effective protection of distributing transformers against lightning and static disturbances can be attained only through the installation of a suitable lightning arrester on each wire of the transformer primary circuit, on the pole on which the transformer hangs. It is claimed that if a lightning arrester is located even one pole away, the difference of potential on the transformer due to lightning disturbances may be double that which would obtain were the arrester on the same pole with the transformer.

Ground wires should not be connected to gas pipes because there is always the possibility of a spark or arc between lengths of a gas pipe so connected, due to a faulty coupling or a rusty joint. Such an arc might ignite the gas and cause a fire. Furthermore, the discharge might, instead of following around the metal work of a meter, jump directly across portions of it and produce an explosion.

Ground wires should not be run inside of iron pipes unless the ground wire is electrically connected to the pipe at the point where it enters it. If the electrical connection is omitted, the iron pipe incasing the wire will greatly increase the reactance of the ground lead, thereby causing it to present immense opposition to the high-frequency lightning-discharge currents.

The function of the choke coil is to provide a certain amount of reactance in a circuit between the outside line and the apparatus which the lightning arrester is to protect. Reactance offers great opposition to lightning-discharge currents and hence tends to force them to take a path through the lightning arrester to ground rather than through the apparatus in the station to ground.

Choke coils must be thoroughly insulated. The insulation may, for a low-voltage choke coil, be provided by the base on which the coil is mounted. High-tension choke coils are supported on insulating pillars, as shown in Fig. 21, II. The choke coil is always. as shown in Fig. 1, connected directly in the line and hence is at line potential whenever the circuit is alive.

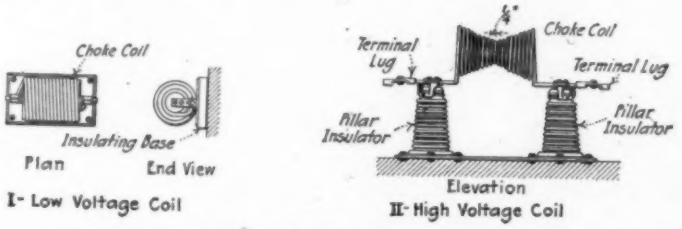


Fig. 21.—Choke Coils for Low and High-Tension Service.

National Association of Electrical Inspectors.

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WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
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H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The vacation season is practically over and the secretary is beginning to receive information as to the fall activities of the sections. For his own part, he is at home again and is to be addressed, as usual, at Concord, Mass.

R. Weaver, electrical inspector for the Missouri Inspection Bureau, St. Louis, Mo., and Ernest E. Choate, municipal electrical inspector for the town of Milton, Mass., have become members of the Association.

It is the custom in a number of places for the chiefs of inspection departments to hold at intervals conferences, to which contractors, wire men, etc., as well as inspectors are invited and at which questions on the Code, wiring and correlated subjects are discussed. The two questions presented this week are two which arose under these circumstances and were presented to me by one of the most valued and energetic of our Executive Committee members with the hint that a number of inspectors found it difficult to answer wiremen's questions of similar nature. Several of our members felt that they were not strictly Code questions, yet they seemed to me so closely connected therewith (Rule 1 containing some very condensed and technical matter) that they were suitable for our column, and I asked one of our members to reply rather at length (which accounts for the length of one reply to No. 311), especially as three of our members stated they did not grasp the meaning of autotransformers in connection with direct-current generators.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Protection of Two-Wire Direct-Current Generators.

Question 310.—There is a difference of opinion as to just where the fuse protection referred to in paragraph two, Rule 1d should be placed. Some inspectors insist it should not be placed in the line with the series field or connected thereto. Why so?

Answer 1(E). Our experience has been to require the placing of the fuse in the lead which is not connected to the series winding. I think an earlier edition of the Code had a similar wording in its rule on this subject. In a shunt-wound generator, however, the fuse may be placed in either lead. This would be true, also if a single compound-wound generator is used.

Answer 2 (T). For a single two-wire direct-current generator either shunt or compound wound it would make no difference in which lead the single-pole protection as mentioned under Rule 1, section *d*, second paragraph, be placed. For compound direct-current generators operating in parallel single-pole protection should not be placed in lead connected to series field; owing to the effect of current flowing through equilizer a fuse placed in this lead would not provide proper protection for the armature.

Answer 3(P)*. I consider the question to be incomplete. In the case of a series-wound generator the placing of the fuse anywhere in the line at the machine will satisfy the rule. If the machine is compound wound, however, care must be taken to see that the fuse is so located that when it blows it will open the shunt-field circuit as well as the series field.

Answer 4(F and G). The rule in question only requires single-pole protection. It is very evident that the closer we can place this protection to the armature (which is the source of supply) the better protection we get. If the fuse is placed in the main connected to the series field, then the protection is removed just that much further away. Also, if the series-field insulation broke down with the opposite polarity grounded, a fuse placed in the lead not connected to the series coil would receive all of the current returning to the armature and would protect the machine.

Answer 5(S)*. If the person who sent this question will consult a drawing, of two compound dynamos in parallel, he will find that serious troubles might arise if the single-pole protection was placed in the line with the series field. If the series side of the line should be opened this dynamo would become a motor and run as such by current from the other dynamo. If the question is for a single machine, the protective device might be placed on either side of the line and same would be approved.

Answer 6(M). The Code does not state that the fuse protection should be placed in the line with series field. Where a machine is operating as a single unit I can see no objection to the protection referred to. Where compound-wound generators are operating in parallel, if the fuse in the series lead were open, the current would still have a path to the armature through the equalizer connection, which may be the objection raised by the inspector in question.

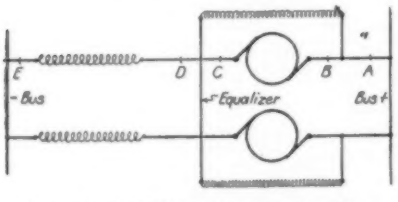
Answer 7(D). In answer to this

question, would state that I do not know why some inspectors prohibit the fusing in the line with the series field or connected thereto. Perhaps those who are objecting could give us some information.

Answer 8 (O). Except for a generator on a two-wire grounded system where the safety device must be placed in the grounded lead, the Code does not specify which side of the circuit is to contain the safety device. It is doubtless true that the opening of the main circuit of a compound-wound machine at a point near the series field would, owing to the inductive "kick" from the series winding, be less desirable than opening the other side of the circuit. The inspector may properly recommend that the fuse or circuit-breaker be not placed in the side containing the series field, but he has no right under the Code to demand it.

Answer 9(R)*. The Code requests this protection to be placed in the lead not connected to the series field. I presume a fuse so located is not subjected to so large an inductive effect from the field discharge, in case of a heavy short-circuit under load, in view of the fact that the armature is in series with it and the field.

Answer 10(N)*. When a series or compound generator is operated singly it makes no difference in which lead the single-pole protection is placed, except the strict wording requires that it be



No. 310.—Location of Fuses for Two Direct-Current Generators.

placed between the armature and shunt-field connection.

When, however, these two types are operated in parallel with other machines the presence of the equalizer introduces a pronounced change of possibilities. The single-pole protection may be placed at either of the five points *A, B, C, D,* or *E*. If it be placed at *A* and it opens, it leaves the shunt field excited and entire machine alive up to the machine end of the fuse. If at *B*, the armature is opened, but shunt field excited from the bus. If at *C*, the armature is opened but shunt field excited from bus as before. If at *D*, the outside circuit of machine is open, but machine may drive as a shunt motor from the other machine under certain conditions. *E* is ruled out as too far from the machine; also, if the fuse be at either *D* or *E*, the current distribution through the other series coils in parallel will be entirely altered.

The most suitable place under all the circumstances, as I read the rule, is at *B* (and possibly noting the last line of Rule 1 *d*, second paragraph, arranged to open the equalizer also, though I do not feel certain about this and rather doubt its wisdom). The objection to *C* is greater risk from the inductive action of its series field. I do not see how any inspector can under the rule insist on *B* rather than *C*, though he may certainly advise it wisely enough.

Protection of Three-Wire Direct-Current Generators.

Question 311. Rule 1d, fifth paragraph, requires a safety device to be put in each armature lead, and connected so as to receive the entire current from the armature. When autotransformers are used with this type of generator in order to get a neutral connection, should these transformer leads be protected and how?

Answer 1(E). Outside my experience.

Answer 2(T). If protection as specified by the Code for three-wire direct-current generators be provided, the leads to transformers or autotransformers as used with this type of generator would not need any further protection.

Answer 3(P)*. Read Rule 23 in connection with this question and then determine whether or not it would be permissible in any given case to supply fuses to the transformer leads, bearing in mind the fact that there are a number of situations in which it is very undesirable to have the neutral leg of a circuit open without the other legs opening simultaneously.

Answer 4(F and G). Reading a little further in this rule, we find the statement that "fuses will not be acceptable." Circuit-breakers only are approved and the safety devices must be so installed that no one pole can be opened without simultaneously disconnecting both sides of the armature from the system. The above rules, together with the question of fusing the transformer leads of the three-wire generator, are based upon the same reasons, namely, the design of a three-wire generator is such that it cannot safely carry an unbalance of more than 25 per cent of its full-load current. Fuses are not permitted because one side only may operate and allow the full load of the opposite side to flow through the neutral connection which would constitute an abnormal unbalance and, of course, interlocking circuit-breakers are required for the same reason. If any circuit-opening devices are placed in the several transformer leads, then the opening of any one of the devices may permit excessive voltage to be impressed upon a section of the transformer winding, with resulting complications and trouble, depending upon the amount of load connected to the generator at the time.

Answer 5(M). Fuses should not be placed in the leads of the auto-transformers used in connection with three-wire direct-current generators. These transformers are interconnected so as to provide a neutral connection which it is believed should be continuous from armature to line.

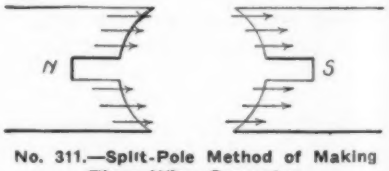
Answer 6(D). In my opinion the transformer leads should not be protected by fuses and these transformers should be located as near as possible to generator.

Answer 7(B)*. For type of machine referred to, a circuit-breaker, so designed that all wires will be opened when breaker operates, should be installed.

Answer 8(O). A transformer used in connection with a three-wire generator, whether or not it is mounted in or on the generator frame, is to be considered a part of the generator itself and does not need fuse protection any more than the shunt-field circuit needs protection. It would seem to the writer very undesirable to open any part of this circuit.

Answer 9 (R)*. Transformers so used should be protected on the primary side to their full capacity.

Answer 10(N)*. A complete reply to



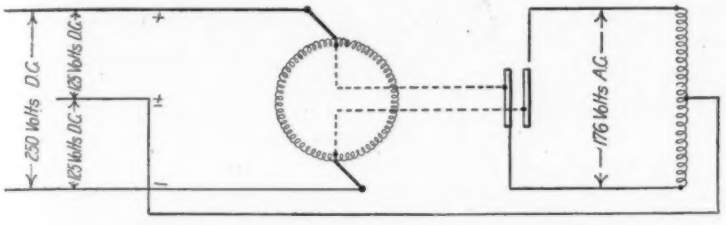
No. 311.—Split-Pole Method of Making Three-Wire Generator.

this question would carry us far afield, and hence my reply will be as condensed as possible. There have been several types of three-wire generators worked out, of which two may be mentioned; first premising, however, that the point of difficulty lies in getting a tap to a point in the armature winding which shall always be electrically midway between the positive and negative brush-contact potentials and to which the neutral wire may be connected. The earliest thought was simply to place a third brush on the commutator midway between the + and — brushes, but of course it was found that when the latter brushes were properly placed for sparkless commutation, the so-called "neutral" brush was connected to coils lying in the very strongest part of the field and consequently sparking at that point was so

violent as to be prohibitive. The two types above referred to are:

First, the split-pole type in which the *N* and *S* pole pieces are split as shown so as to leave under the middle of the pole a vacant place where the field is very weak and where the "neutral" brush may more readily be placed. Or an ordinary four-pole machine may be used, making two adjacent poles north instead of two opposite ones, and making the two brushes between the two similar poles of each set the "neutrals."

The second type (the one referred to in the question) is based on the Dobrowolsky patents. It is essentially a machine like a synchronous converter or double-current generator. That is, we have an armature of one of the types of winding suitable for these machines and designed for say 250 direct-current voltage. This winding may now be tapped to a pair of slip rings when it will develop a single-phase alternating-current voltage of about 176 volts. Or it may be tapped for three phase or two phase, if desired. Suppose now we connect between these two slip rings an autotransformer of very low resistance, large current capacity and high inductance with 176 turns and hence a voltage drop of one volt per turn, while the alternating-current magnetizing current normally flowing will be almost negligibly small.



No. 311.—Three-Wire Generator With Autotransformer.

If now we tap this autotransformer between the 88th and 89th turns, we have a point which is exactly half way always between the two alternating-current brush potentials; in other words, it is the electrical center of the armature and half way between the two direct-current brush potentials, 125 volts above the negative and 125 volts below the positive and hence a suitable place for the neutral connection.

The connections are as shown. Now when the three-wire direct current is unbalanced, a current will flow over the neutral and back to the armature through the coils of the autotransformer, which, being of low resistance, offers practically no opposition, its inductance not counting of course in this case. In an actual machine three-phase or two-phase arrangements are better as allowing more return paths for the current over the neutral and better distribution in the armature windings.

The wording of the last part of the fifth paragraph of the rule referred to in the question is placed there to distinguish between shunt and compound machines. In the latter we have to split the compounding coils into halves and put half on each side of the armature, otherwise when the three-wire system is unbalanced the machine will not compound properly. Hence we have two equalizer leads to be opened.

A little consideration will show that any fusing of the alternating-current taps and leads might cause very dangerous conditions of unbalanced armature currents, partial or total loss of neutral, etc.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Pacific Telephone & Telegraph Company has entered a formal application asking the Commission to make an investigation for the purpose of determining uniform rates which may apply throughout the state.

MASSACHUSETTS.

Charles A. Russell has been nominated by the Governor as a member of the Public Service Commission, to succeed Clinton White, who retired last spring.

NEW YORK—Second District.

New York & North Shore Traction Company. The Commission has decided, in an opinion by Commissioner Frank Irvine that it has no power to modify the terms of a franchise granted by a municipality to a utility company.

The New York & North Shore Traction Company asked that the Commission determine that the just and reasonable fare between Mineola and Port Washington is 15 cents instead of 10 cents, to which the road is limited by the terms of its franchise granted by the supervisors of Nassau County and the Highway Commissioners of the Town of North Hempstead.

The applicant contended that the power to grant franchises in a municipality was but a power delegated to the municipality by the Legislature, and that the Legislature or the Commission, to whom the Legislature has delegated general power over rates, could amend the franchise.

Judge Irvine in his opinion cites a clause in the Constitution providing that no law granting a street-railway franchise can be passed without the consent of the local authorities and the abutting property owners. He says that if the language of the Public Service Commissions Law giving the Commissions power over rates were to be construed as giving the Commission power to change the terms of a local permission, it would undoubtedly be unconstitutional.

WISCONSIN.

City of Barron Light and Water Utilities. The Light and Water Commission of the City of Barron applied for authority to adjust its flat rates and install meter rates. The investigation was handicapped by lack of sufficient data and confusion in the accounts of the utilities. Tentative meter rates were prescribed by the Commission, which may be revised after the results of metering a portion or all of the service is known.

Commenting upon the necessity of rate revision, the Commission says: "The most important problem which arises in connection with a public utility is the adoption of a satisfactory system of rates. There are, of course, other problems arising, but they are less serious than the problem of determining an equitable rate. The flat rate is glaringly inadequate to allocate charges in an impartial manner. Such rates open up a possibility of waste or reckless and unnecessary use by the consumer, because the cost to him is

determined only by the number of fixtures connected and is not based on the water consumed."

In considering proper rates to be charged for service rendered by the water utility to the city, the decision says: "If the relations between the city and the utility are to remain as they have been during the past, considerable uncertainty will exist as to the relative indebtedness of the city to the water department and vice versa. In the past the water department has charged the city with earnings from hydrant rentals. When the water works has to make extensions, etc., beyond the limit of funds on hand, said funds being obtained from earnings of general service, the city is called upon to furnish the money. The difference between the debits and credits to the city under this scheme is incorrectly shown in the balance sheet under the heading 'Depreciation Reserve Fund.'

"The Board of Water Commissioners has asked for the establishment of a different system of relationship between the Commission and the city in place of the conditional arrangements which now exist. It appears to be a good business policy to treat a municipal water plant or electric plant as an enterprise separate and distinct from the municipality itself, and to have accounts kept accordingly. If this policy is followed the city should pay the utility, at a reasonable rate, for all service rendered the city, in order to avoid unjust discrimination in favor of the taxpayers of the city as against consumers; the utility, in turn, should pay the city a reasonable amount as taxes and as interest on the city's equity in the property of the utility, in order to avoid unjust discrimination in favor of the consumers as against the taxpayers. It naturally follows, also, that the city should provide all funds required for plant extensions," etc.

The Chippewa County Telephone Company was denied authority to extend its lines to serve a subscriber in the town of La Fayette. The subscriber is at present served by the Wisconsin Telephone Company, which company filed an objection to the construction of the line in question. The subscriber is a tenant on a farm and desired the change in service so as to be able to communicate directly with his landlord. The Commission finds that his service and the landlord's service are otherwise adequate.

Owing to changes that may take place in the ownership of the farm, its tenancy, or the conditions of the lease, the continuance of any advantage of the service of the Chippewa Company over the present service through any length of time seems problematical. The Commission says: "To permit the extension of a line of telephone to reach a subscriber already having at hand telephone service which would fulfill all of the ordinary requirements, depriving an existing system of a potential subscriber and allowing the proponent company to make an investment that may at any time become idle, would seem to be ruthless treatment of the principle upon which the anti-duplication act is based. The whole spirit of the law is to make for permanency, for settled conditions, in the telephone field, and for that sense of security of telephone investments that comes from a certainty that no encroachment will be permitted upon territory already efficiently served when the company occupying it has not overbuilt its natural boundaries. Considered from the viewpoint of the proponent company this extension, if allowed, would appear unwise; considered from the standpoint of the objector, it would be unfair." * * *

"It is but natural for people to wish to get more for their money. However, when a subscriber to telephone service is offered communication at a fair rental with his neighbors and with his business center he may consider that, so far as extent of service is considered, he should expect no more without an additional charge. Messages that pass beyond the natural limitations of the community in which the subscriber has his ordinary business and social interests may be classed as toll messages for which an extra charge may be made. The fact that a subscriber has made an investment in a locality beyond these natural limits does not entitle him to telephone accommodations to reach that locality without extra charge."

Reduction in Residence Rates of the Milwaukee Electric Railway & Light Company. The Milwaukee Electric Railway & Light Company has made a reduction in rates for residence lighting under its schedule based on consumption per active room. The change is made effective as of October 15, 1915.

The former rate provided a primary charge of 11 cents gross per kilowatt-hour, a secondary charge of 5 cents gross per kilowatt-hour and 4 cents for the excess. The primary charge is left unchanged, but the secondary charge of 5 cents is applied to all energy consumed in excess of that paid for under the primary rate, up to a consumption of 7 kilowatt-hours per active room per month instead of up to a total of 100 kilowatt-hours, and the excess rate is reduced from 4 to 2 cents per kilowatt-hour.

The company also announces that with the increase in the number of customers further reductions in residence rates will be made as a means of sharing with its customers the economies achieved through increased patronage.

The new rates are as follows:

Primary Charge—11 cents per kilowatt-hour for (1) the first 4 kilowatt-hours consumed per month for each of the first four active rooms, (2) the first 2.5 kilowatt-hours consumed per month for each of the active rooms in addition to the first four.

Secondary Charge—5 cents per kilowatt-hour for all energy in excess of that paid for at the primary rate up to a total of 7 kilowatt-hours per active room per month.

Tertiary Rate—2 cents per kilowatt-hour for all excess consumed per month.

These rates are subject to a prompt-payment discount for payment within ten days from date of bill of five per cent of the first $25.00, and one per cent on amounts in excess of $25.00, and a minimum charge of 50 cents per month per meter.

All rooms are considered active, except three bedrooms, bathroom, basement, garret, closets and back porch.

The following agreement for further reductions is also announced by the company: The present customers in Milwaukee and immediate suburbs number 32,276. When the number of customers in the same territory reaches 40,000 the primary rate to residence customers will be reduced to 10 cents gross, or 9.5 cents net, per kilowatt-hour. When the number of customers in the same territory reaches 50,000, the primary rate to residence customers will be reduced to 9 cents gross.

Production Meter to Check Building Operations.

In the construction of the new buildings for the Massachusetts Institute of Technology, at Cambridge, Mass., by the Stone & Webster Engineering Corporation, of Boston, a Productograph, manufactured by Slocum, Avram & Slocum, New York City, is installed as a means of keeping the superintendent informed at all times as to the output of the several concrete mixers on the work.

The annunciator and recording instrument are installed in the superintendent's office, and its five fingers and dials are electrically connected with each of the mixing machines. Not only is the number of batches of concrete produced in a day recorded, but the time taken for the mixing of each batch is also recorded.

The productograph is considered by Superintendent Carr as not only desirable and valuable in stimulating a healthy rivalry between the several mixer gangs, but indeed necessary to produce to advantage.

For the benefit of shipping in the Caribbean Sea, the radio station at Colon, Panama Canal Zone, sends broadcast each day a weather forecast received from Key West.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.

Annual Convention, Detroit, Mich., September 8 to 11.

The ninth annual convention of the Association of Iron and Steel Electrical Engineers was held at the Hotel Statler, Detroit, on September 8, 9, 10, and 11. The convention excited unusual interest because of the importance of the papers to be presented and as a result there was an attendance of nearly 300.

The first session, on Wednesday afternoon, was opened by a paper by R. F. Patterson on "Improving Non-Condensing Power Plant by Use of Direct-Current Mixed-Pressure Turbine Equipment."

Mr. Patterson described in detail such a change as his title indicates, giving several tables tabulating advantages against disadvantages in very complete fashion. The addition of the turbine, in this case, cost about $83,000 and procured a saving to the plant of $30,500 a year—a net saving of $20,000.

The second paper of the session was "Wire Rope and its Relation to Steel Making," by J. F. Howe.

The author first traced the history of rope manufacture from its origin to present modern methods.

The session then adjourned until Thursday morning.

The Thursday morning session opened with Past President Friedlaender in the chair and an audience which taxed the capacity of the hall.

The first paper was "Recent Developments in Power Generating Apparatus," by P. M. Lincoln. Mr. Lincoln spoke of the extraordinary progress of the past few years in generating apparatus. He cited the units installed for the Interboro Rapid Transit Company, where an economy of better than 11.27 pounds of water per kilowatt-hour at the buss, was obtained. This unit, he said, was rated at 30,000 kilowatts—a size undreamed of only a few years ago, when (in 1898) a turbine of 5,000 kilowatts was the limit. Mr. Lincoln prophesied that the capacity of the future unit will be fixed by the demand, rather than by any inability to produce them in any sizes whatever.

Mr. Lincoln then presented some curves showing the ideal water rate of steam turbines under varying conditions of steam and vacuum and showing the relation between this rate and the size of the unit. These curves, he pointed out, showed the inherent advantage of central-station power over any isolated plant, in view of the so largely increased economy of the former, due to its immense units.

Mr. Lincoln went on to say that economies in water rate was not the only economy resulting from the use of large units. One very important item is economy in labor and also that due to diversity-factor. Mr. Lincoln emphasized this point because of a tendency among steel engineers to consider that the amount of power they require justifies a special plant. He pointed out that his curves show conclusively that "no matter how large an amount of power is required, it can be generated more cheaply if it is made a part of a still larger supply."

In closing Mr. Lincoln spoke of the growing tendency to adopt 60-cycle current as standard, even having replaced 25 cycle to such an extent as to almost "establish a claim to universality."

The next paper was entitled, "Protection and Control of Industrial Electric Power," by C. P. Steinmetz.

Dr. Steinmetz pointed out, first, the many advantages of electricity over any other form of energy, among them being: High efficiency, simplicity of conversion to other forms of power, possibility of unlimited transmission and distribution, concentration of power generation in one station with interconnecting trunk lines in reserve, the availability of any or all of the power at any desired point. These considerations called for the necessity of means of preventing shut downs because of accident.

Therefore, Dr. Steinmetz said, it is necessary not only to limit the power which may, by accident, be let loose destructively; but also to protect the system against any accident in any part.

In limiting or rather preventing the concentration of power at the point of accident, circuit-breakers, fuses and the like are of little avail. Dr. Steinmetz, rather recommended reactance in the generator circuits. Generators should be built with as much internal reactance as consistent with economical and efficient design and the rest of the necessary reactance put in the generator leads. The speaker pointed out that additional feeder reactances were desirable but not essential if the generator circuits were protected.

Dr. Steinmetz then mentioned the reverse-current relay and its use in segregating the apparatus in trouble without shutting down the system.

Lightning and its disastrous effects on transmission lines and electrical equipment, was then touched on. Aluminum-cell lightning arresters are the remedy, here, the writer advocating these as the best known preventative of trouble from this source. However, the aluminum cell cannot protect against high frequency, the only remedy being the overhead ground wire.

"First class installations, high insulation and effective controlling and protective devices are the requirements of efficient, reliable and therefore economical operation. However, they are only half the requirement, and equally important is the operating staff." The latter requires system and organization and above all, accurate records. "Reliable and complete records are essential to get the exact facts, to find what happened and how it happened so as to guard against its recurrence." For this purpose Dr. Steinmetz recommends the "Multi-Recorder," a device which records the exact second when any event in the station takes place, as, for example, the opening or closing of switches or circuit-breakers, recording of grounds or shorts, excess currents, high frequency, lightning discharges, etc.

In opening the discussion Mr. Friedlaender emphasized the necessity for installing reactances and any other protective device which would tend toward "safety first."

Mr. Lincoln advocated the placing of reactances in the feeders rather than in the generator leads. He also advocated the overhead ground wire as the best method of lightning protection—the forming of a "cage" by two or even three wires being recommended.

After some further discussion the meeting listened to E. Friedlaender on "Motor Generators versus Rotary Converters," with J. C. Reed in the chair.

Mr. Friedlaender disclaimed any intention of advocating either type of machine but proposed to compare the two. As a general proposition, he said, if the conversion of alternating-current to direct-current is alone in question, the rotary will give better efficiency and the motor-generator set greater flexibility of operation.

In detail, the writer pointed out that the difference in first cost was too slight to mention; that the "rotaries require considerable more floor space than motor-generator sets," that the difference in efficiency was not important in steel-mill practice, that the rotary operates at unity power-factor and a motor-generator set at 0.8 leading power-factor.

In the matter of power-factor correction, the rotary allows only one-tenth the amount of correction possible with a motor-generator set. "The power-factor correction value of a motor-generator set is limited only by first cost and does not depend upon the load carried by the machine, while such value of rotary is practically nothing and cannot be properly controlled on variable loads."

"In steel-mill service, motor-generator sets seem to be preferable to rotaries only from the standpoint of good regulation." The dependence of

delivery voltage upon impressed voltage, in rotaries, presents a serious obstacle to their satisfactory operation in steel mills.

As to load-factor, the writer said "practice has proven that the load-factor of a motor-generator set delivering direct current in parallel with other sources of power, is limited only by the temperature rise, but the load-factor of a rotary under such conditions can hardly exceed 75 to 80 per cent and give reliable service."

In operation, Mr. Friedlaender maintained the motor-generator set far superior to the rotary on the ground of ease of operation, freedom from trouble, and greater reliability.

In conclusion, the writer said that rotaries could only be recommended where the direct-current end is not paralleled with other sources of direct-current power, where even approximately constant direct-current voltage is not required, and where power-factor correction is of no value.

C. W. Parkhurst, in opening the discussion, took issue with Mr. Friedlaender as to his conclusions, maintaining that the rotary was satisfactory with respect to power-factor correction, that the attendance cost was much less, that first cost was less and reliability and efficiency greater than a motor-generator set. He further stated that a rotary could be paralleled with other direct current with entire success.

P. M. Lincoln spoke also in favor of rotaries, making the point that with the transformers which are necessary for a motor-generator set at modern transmission voltages, a rotary will cost much less. And even if transformers are not used with the motor-generator set, the rotary transformers are more to be relied on than the high-voltage motor of the motor-generator set.

He pointed out that because the motor-generator set operated most of the time (in a steel mill) at less than half load, the rotary was far superior in efficiency. He said the capitalized value of the difference in efficiency will equal the first cost of the motor-generator set. Mr. Lincoln agreed with the writer of the paper on the point of power-factor correction where such correction is essential, but maintained that such was not the case in a steel mill.

S. S. Wheeler stated that rotaries would, in general, meet all demands and should have unlimited load-factor in parallel with other sources of power.

Gano Dunn said his views had always been those of Mr. Friedlaender but he was willing to revise them according to the contentions of Parkhurst and Lincoln. He pointed out, however, that the power-factor correction characteristic of the motor-generator set would more than offset any difference in cost and would put the two machines on a par, economically.

Mr. Tyne stated that a motor-generator set permits a higher plant load-factor and that efficiency was unimportant with purchased power.

In closing, Mr. Friedlaender pointed out that the circumstances governing in each plant would determine the choice. He explained Mr. Parkhurst's and Mr. Lincoln's views by the conditions in their plants which warped their judgment in this regard.

The meeting of Thursday afternoon opened before a large gathering with the paper, "Some of the Latent Developments in Electrical Equipment," by K. A. Pauly. The writer first spoke of the efforts of steel engineers to obtain flexibility of speed control with alternating-current motors. He touched briefly on the two best systems of accomplishing this—the Scherbius system, and the rotary-converter system. Several installations of both systems are in operation and each with success—the former being the more usual. The three chief advantages of the Scherbius system are: requires one less machine (rotary); roll motor can be adjusted to operate at synchronous speed at any load; the power-factor of main roll motor can be raised to unity.

Mr. Pauly then spoke of recent electrification of mines, especially in connection of large hoists, automatically operated.

The writer then spoke of the so-called "truck type" of switchboard in which the high-tension equipment is entirely inclosed and out of reach and all apparatus, connections, and small wiring are mounted on a movable truck. The removal of this truck permits access to every part.

In opening the discussion, W. Sykes explained that the objections to the rotary system disappeared if properly installed—that the rotary could operate at two cycles if so low a speed were necessary.

Mr. Sykes said the electric hoist proposition was not new and that "truck type" switchboards have been common in Germany for 10 years. He spoke of the electric reversing mill as the latest development worthy of note.

Dr. Karl G. Frank presented the next paper on "Progress in the Iron and Steel Industry and the Electric Furnace." Dr. Frank outlined the history of the iron and steel industry. He showed, finally, how the demand for very high quality and special alloy steels necessitated the development of the electric steel furnace. Before 1900, he said, the demand was for quantity—since that time stress has rather been on quality—price being really immaterial. Dr. Frank spoke of the electric furnace, not as an experiment or an untried innovation at all, but as an established fact. "The electric furnace," he said, "is to-day without exception, the best means to produce high quality steel." He pointed out, however, that the electric furnace is not intended to and probably will never compete with the blast furnace. It is essentially a refining process and actual melting will always be done otherwise.

The electric furnace offers these manifest advantages over all other methods of making steel:

(1) It produces the highest temperature obtainable.

(2) It produces that temperature without contamination of the charge.

(3) It offers a ready and easy means to control that temperature.

There was very little discussion following Dr. Frank's paper as it dealt with generalities and facts well known to all.

Following Dr. Frank, Prof. W. S. Franklin gave a talk on "Mechanical Analogies in Electricity and Magnetism." He took several well known electrical phenomena and by simple mechanical contrivances gave his audience their exact mathematical analogue. His talk was addressed to the layman with the evident intention of making him see various electrical phenomena in the every-day things of life. For example, he illustrated the effect of power-factor on capacity with two egg-beaters. He showed the effect of introducing capacity and induction in a circuit by a reciprocating rod attached to a lever one end of which is attached to a spring, the other end to a cylindrical mass. The spring represented capacity, the mass, inductance and their respective motions showed the effect of high or low frequency in a circuit and the effect of capacity in correcting power-factor. His experiment with superimposed oscillating waves he demonstrated with a vertical lever on each end of which was a toy car free to move horizontally, the lever being supported by springs. Altogether, the lecture was instructive and held the interest of his audience. There was no discussion.

The first paper to be presented on Friday morning was "The Electrification of Steel Mills and the Use of Central-Station Power," by Brent Wiley and Wilfred Sykes. The authors first called attention to the number of steel plants using central-station power and their tonnage—the large and various field for the profitable installation of motors—and the economies and efficiencies resulting. They point out that the number of motor-driven rolling mills is 200.

Consideration, in installing proper size of motors in a mill, must be given to the following points: Volume of

metal displaced; how displaced; time of rolling and number and weight of pieces rolled per hour; type of mill and method of drive.

Of course, accurate and complete records and data are essential to the above considerations.

The authors then cited the chief advantages of motor drive:

"Provides the most practical method of generating and utilizing cheap power.

"Provides an economical method of distributing power.

"Greatly reduces maintenance and general repair charges.

"Insures greater reliability of operations, as there is less wear and breakage of driving unit, and mill parts, including rolls, couplings, pinions, etc.

"Greater average output and better quality of product, due to speed characteristics of driving unit—much more economical use of power.

"Motor drive easily applied to mill.

"Control simple and easy to operate.

"Increased economy of operation of mill, where it is subject to frequent idle periods and where speed adjustment is required.

"Provides means of utilizing favorable propositions from large central-station companies, the principal advantages being as follows: Reduces first cost of installation; management free to concentrate attention to making steel rather than power; central-station power is always available and is very reliable."

In closing, the authors pleaded for greater co-operation between the steel company, the central station, and the motor manufacturer.

There was no discussion of this paper at this time, the next paper being so similar in scope as to render one discussion for both advisable.

C. S. Lankton then presented his paper on "Purchased Power for Steel Mills."

Mr. Lankton first assumed a plant of 3,000 kilowatts capacity. He then traced the cost of such an isolated plant as against the cost of purchasing corresponding power. He pointed out that the former would require two 1,500-kilowatt units and one spare. The latter (central station) having units as large as 15,000 kilowatts and better, require no new equipment. Further, the 1,500-kilowatt unit costs $15.00 per kilowatt and the larger $10.00. There is no saving in building on floor space. Fixed charges on the larger are 30 per cent and on the smaller plant 50 per cent of the producing cost. The refinements of operation necessary to a large plant, but impossible, economically speaking, in a small one, is another item in favor of the central station. Again, the efficiency of the larger unit is 20 per cent greater than the smaller. The labor item is less, relatively, in the big, than in the small plant. The load-factor of the central station being higher than that of a small plant (average steel mill less than 50 per cent) gives the former another advantage. Hence the successful competition of the central station with the isolated plant. The author emphasized the reliability of central-station power as against the erratic operation of a private plant.

The writer did not recommend the wholesale and off-hand adoption of purchased power in steel mills, but recommended that power be bought for extensions and replacements, thus gradually equipping the whole plant with central-station power as being best and most economical from every point of view. A new plant just being built, should exhaust every means of purchasing power before installing its own plant.

In opening the discussion on these two papers, Mr. Friedlaender complimented Mr. Sankton on presenting "the best paper ever presented to this association by an active member." This paper covered the consumer's viewpoint as in distinction to that of the central station. Mr. Friedlaender emphasized the necessity of co-operation between the consumer and the central station to their mutual advantage. He pointed out that the chief factors to be considered in purchasing power were price and reliability or continuity of service.

T. E. Tynes deplored the lack of definite data on relative costs. He objected to the demand method of basing electric charges and advocated a flat rate.

J. C. Reed agreed with Mr. Tynes in the matter of rates.

C. W. Parkhurst said he doubted if the reliability of central-station service was greater than that of a big private plant.

C. A. Menk added to Mr. Sankton's paper the considerations that plant extensions can be made much more quickly with purchased power. He said the question of investment and space required were items vastly in favor of the central station. The central-station management looks ahead and provides for all possible contingencies and growth. This the steel man cannot do. He must meet his problems as they come.

R. S. Huey objected to purchasing power. He complained of the "complicated rates" and peculiar method of billing of central stations. His entire unfamiliarity with the theory of rates was shown when he advocated a flat rate because a steel mill generates its own power at a flat rate—obviously false.

D. M. Petty advocated central-station service as a reserve for emergencies and for carrying the peak load. He called attention to the fact that reliability was entirely a matter of good or bad construction.

W. T. Snyder said a private plant was not justified except at very high load-factor and where there is a balance between waste fuel and the demand for power.

E. Chesrown ridiculed the contention that a private plant could compete with a central station in the matter of reliability of service. He said most steam plants in steel mills existed because of the steel engineers sticking to the traditions of their forefathers or because of the ambition of some young engineer to "show off," or else because of the recommendations of some consulting engineer who had been "subsidized." He pointed out that the peak charge of the central station must be met in an isolated plant in exactly the same way and to the same degree—only greater. "If the charges are reasonable you can't compete with the central station on the peaks or otherwise—least of all on the peaks."

H. C. Gille said the time would come when there would be no minimum bill in electric charges.

R. L. Baker defended the demand method of charging for electricity, showing the injustice to consumer and electric company, alike, in a flat rate.

Mr. Sankton, in rebuttal, added these considerations to those covered by his paper—motor drive gives a decided improvement in the quality of product, it lends itself to the easy procuring of reliable data, and aids in smoke abatement.

The meeting of Friday afternoon opened with D. M. Petty's paper on "Some Electrical Applications in Steel-Mill Practice."

The writer introduced his subject by briefly considering, first, line shaft drive, second, group drive, and third, individual drive. The latter is largely used in steel mills and requires adjustable-speed motors with automatic control. He presented several curves showing the lessened strain on the motors and equipment when started and stopped automatically rather than manually. "The automatic controller protects the motor from not only excessive currents in starting, but excessive voltages in stopping. It decreases the starting and stopping time which will amount to a considerable item when the operation requires frequent stopping."

Mr. Petty then spoke of the reversing motor, laying emphasis on dynamic braking.

To offset the slow speed of direct-current series-wound motors when running at low voltage, the writer suggested additional copper but recommended a series booster set. He added, however, "a better solution of the problem

of overloads lies in the fly wheel generator set installed at the end of the line." He stated that the booster set or fly wheel generator, or both, would not be justified because of increased cost of power, were it not for the greatly increased speed of production resulting from their use.

Mr. Friedlaender, opening the discussion, spoke strongly in favor of magnetic control of motors.

P. Caldwell presented several slides showing other methods of connecting the series relay with interlocking device to prevent sparking.

Mr. Kennedy advocated the fly-wheel generator as a means of lessening the cost of purchased power. He cited an instance where the cost had, by this means, been reduced from 2.4 cents to 0.7 cent per kilowatt-hour.

J. C. Reed advocated steel conductors in place of copper for the transmission of large amounts of power.

Mr. Richardson pointed out that the series field relay should be by-passed so as to give full field strength or reversal of motor.

The next paper was "Latest Development of Electric Cranes for Steel Mills," by E. H. Kendall of the Alliance Machine Company.

Mr. Kendall divided his subject as follows: Control and operation; accessibility and interchangeability; efficiency and maintenance; and safety features. The author treated each of these subjects with respect to the various cranes in use in a steel mill showing the latest improvements in each case and the refinements introduced for certain results.

In discussion Mr. Medicine brought up the question of the lubrication of cranes.

T. E. Tynes recommended oil ring bearings—said the grease cup was all wrong.

Mr. Friedlander said forced-feed lubrication should be insisted on for all cranes and similar apparatus.

W. Greenwood then presented the last paper of the convention on "Installation of Electrical Equipment to Comply with Requirements of Safety."

He said, "When all has been summed up it amounts to this: Only a perfect installation of an entire system, embracing its various units, guarantees immunity from accidents." He went on to say that of course a "perfect" installation was not possible but he took steel-mill electrical engineers to task for apparently often ignoring the underwriters' rules and for giving precedence to economy rather than to adequate safety.

After considering changing the time of year for meeting, and kindred topics of general interest to the members, the technical sessions were adjourned and the convention was brought to a close.

PENNSYLVANIA ELECTRIC ASSOCIATION.

Eighth Annual Convention at Bedford Springs, Pa., September 7-10.

One of the most successful conventions since its organization was held by the Pennsylvania Electric Association at the Bedford Springs Hotel, Bedford Springs, Pa., on September 7, 8, 9, and 10. Ideal weather conditions combined with a record registration of 346 members and a wealth of interesting papers and discussion combined to make the gathering unsurpassed by any preceding year. A very agreeable eleventh hour addition to the list of speakers was the appearance of W. D. Ainey, chairman of the Pennsylvania Public Service Commission, who made a very inspiring address just before adjournment of the convention. The entertainment feature was up to its usual high plane of excellence under the guidance of W. K. Kerford of Philadelphia and consisted of motion pictures, dancing, vaudeville, card games, swimming races, bowling, golf tournaments, mountain hikes, auto drives and musicals. Over 60 prizes were offered by various manufacturers to the successful participants in the various competitions. Twenty manufacturers of electrical appliances displayed their goods in attractive exhibits and Prof. E. E. F. Creighton of Schenectady, performed several interesting experiments of insulators with high-voltage, high-frequency apparatus.

The convention was called to order on Wednesday at 10:30 a. m. by President Walter E. Long in the Convention Hall. The roll-call and reading of the minutes were dispensed with and Secretary Müller occupied the chair while Mr. Long read the presidential address.

Mr. Long briefly reviewed the important events of interest to the members occurring since the 1914 convention and commented on the fact that the Pennsylvania Electric Association is the largest geographical section of the N. E. L. A. in the country. He recommended the adoption of an amendment to the by-laws permitting the employment of a permanent secretary to handle the constantly increasing routine business of the Association. It was also suggested that the Rate, the Engineering and Accounting, and the Welfare Committees should be continued in order that the excellent work of those different committees be taken advantage of. On motion, the president's address was referred to a committee for action.

The report of H. N. Müller, of Pittsburgh, secretary-treasurer, was then received. In it was shown the revenue received and the expenses paid out for the year ending September 6, 1914, leaving a cash balance of $625.87 on hand. Vice-president Stephen C. Pohe, Bloomsburg, next submitted the report of the Executive Committee in which was noted that four meetings had been held in Philadelphia during the past year and that seven Class A member companies had been taken in during that time. The Committee decided, after going into the matter thoroughly, to create a Committee on Publicity. The report of the Membership Committee was also submitted by Mr. Pohe. It was shown that the Association consisted of 80 Class A, 1,407 Class B, 28 Class C, 84 Class D and 1 honorary, members in 1914 as against 95 Class A, 1,425 Class B, 20 Class C, 80 Class D and 1 honorary, members in 1915, a net gain of 21 members. Calling attention to the comparatively small gain in membership during the past year, the Committee mentioned that the abnormal business conditions existing in that time cast a deterrent effect on a larger acquisition of new and the retention of old members. The Committee assigned each of its members to a certain district of the state and a particular effort will be made to increase the Class B membership in the coming year. As to Class A members, it was stated that the Association now includes companies serving 93 per cent of the total population of the state. In accepting the report, President Long stated that the work done by this Committee was really phenomenal and the best ever done by a membership committee.

Chairman H. R. Kern, Philadelphia, next read the report of the Accounting Committee. The work of this Committee was devoted to a reconsideration of the classification of accounts prepared for and submitted at the 1914 convention. The recommendations of the Committee have followed closely the N. E. L. A. standard classification making only such changes and modifications to meet the existing conditions in Pennsylvania. It was noted that existing classifications are in a somewhat transitory state and that systems prepared in preceding years are being subjected to changes dictated by latter-day experience and eventually the improvements may issue into a single system that will be accorded practically universal adoption.

E. H. Davis, Williamsport, thought that a classification as submitted, while it might be the foundation for the finding of the Public Service Commission, it is not an ultimate basis on which rates are determined. The division of the expenses as to various classes of service and the division as to investment in the same classes of service is getting more important day by day, he said, and in many cases, it is very im-

portant to keep the capital accounts apart.

Mr. Kern said that the report merely concerns controlling accounts at the present time rather than detailed cost accounting.

W. H. Johnson, Philadelphia, said that there has to be a certain proportion assigned to each class of service when the capital account is to be divided up.

E. D. Dreyfus, Pittsburgh, thought that these detailed matters are ones in which it is necessary for the engineering and accounting departments to get together in the way of seeing what charges should go to different accounts.

Chairman B. Frank Day, Philadelphia, then submitted the report of the Safety and Welfare Committee.

After some introductory remarks touching upon the rapid strides looking to the safety and welfare of central-station employees made during the past year and the good results uniformly obtained therefrom, the report is divided into six parts, each dealing with some particular branch of the ground covered by the Committee. Accident prevention is first taken up and the importance of safety being considered in designing and installing all apparatus whether used in the plant, on the line or in the consumer's premises is given great stress. The prime importance of first-aid treatment is dwelt upon and emphasized by the inclusion of disability due to infected wounds as entitled to compensation under the rulings of most compensation bureaus. The fact that a workman's compensation law goes into effect in Pennsylvania on January 1, 1916, lent much interest in the remarks made by the Committee on that subject. While most of the companies have had some kind of a beneficial association in force for a long time and to whom the compensation act will make little or no difference, the several plans of insurance allowed under the new law are briefly explained and the experience of central-station companies in other states under these different plans were given. Service Annuities, Savings and Investment Funds, Vocational, Education and Physical Development are given quite some attention in the report and the Committee concludes with the admonition that there should be an enthusiastic co-operation of employer and employee for welfare work must be mutual to be of real and lasting effect.

This report provoked considerable discussion which was opened by Irving Samuels, Allentown, who endeavored to show that the greatest importance of first-aid work is in applying it to the line department. He pointed out that in a power station or other department substantially in one particular location, the knowledge of first-aid work need be given to only a small number of the employees in that department while in the line gangs, where accidents happen anywhere from one-half to five miles from the nearest physician, each man should be proficient in first-aid and resuscitation methods.

H. N. Müller, Pittsburgh, gave the experiences of his company and expressed the opinion that contests between gangs of linemen and drills with prizes given for the best attainments, is the only practical way of sustaining interest in the work. Another point brought up was that the physician should be educated to the work to some extent also, as many of them have very meager ideas on the proper methods of resuscitation.

H. H. Ganser, Norristown, after many discouraging experiences in trying to educate his line department, held rallies and awarded prizes for the best work and now has 35 men well qualified to carry on first-aid work.

Mr. Müller, Pittsburgh, in answer to a question, said that experience with the pulmotor has not indicated that it is the best method. He thought that the Schaeffer prone-pressure method is better and that the combination of the latter with the pulmotor is the best combination to be had. J. E. Shute, Altoona, gave some instances of accident cases where the above methods were used.

At this point President Long read a telegram from Dr. C. P. Steinmetz of Schenectady in response to the former's greetings and request for an expression of thought in connection with the part that the central-station man could take in the national defense movement. Dr. Steinmetz replied as follows:

"The most efficient national defense is the patriotism of the masses of people, that is, the wage earners, resulting from their economic conditions being superior to those in all other countries. The central-station men can greatly help directly through their employees, indirectly through their influence on the industrial and educational activities of their community to bring about conditions where the masses have something to defend. Then they will rally to the national defense."

A representative of the Empire State Association then explained the working of the New York compensation law and the measures taken by central stations to comply with it. Chairman Day took occasion to bring to bear on the members the fact that they must make up their mind promptly as to which of the optional methods they want to use under the Compensation Act, as the law goes into effect January 1, 1916. The methods usually adopted in other states were given.

A paper on "Co-Ordination of the Accounting and Engineering Departments," by E. D. Dreyfus, Pittsburgh, was then presented. Mr. Dreyfus said in part:

"There is ever present the economic law that governs all business pursuits which in simple language equates all results in terms of dollars and cents. To determine the true financial showing, careful records of the distribution of money expenditures become indispensable, and here accounting plays its part. The interweave of engineering and accounting in our great industrial structures is therefore quite apparent. The people as a general proposition do not resent attractive profits being made in any business even among those of a public-service character, when it is plain that they are the results of an honest, capable and discerning management. However, they do protest against business gains which are the product of arbitrary systems that are apparently disproportionate and unjustified."

In reviewing the general conditions, the author dwells on the points of contact between the two departments under consideration, the attitude of each, and the common meeting ground. Especially is co-operative action demanded in dealing with valuations, cost accounting and replacement and contingency reserves and the various requirements incidental to each are outlined. The author concludes by making it clear that no over-reaching is to be permitted in the apparent attempt to idealize the working conditions, as all systems in business are in a practical sense restricted within reasonable bounds; however, any time and effort expended to increase the opportunities of the respective departments and their individual constituency must be fruitful.

S. E. Doane, Cleveland, said that in his experience, which has been mostly manufacturing, the manufacturing accounts are far superior to the sales accounts and expressed the belief that the engineer and the accountant have been drawn very close together and that the engineers are pretty fair accountants and that the accountants are fairly good on engineering lines.

F. E. Haag, Bloomsburg, said that harmonious working between the engineering and the accounting departments is the whole kernel in the nut.

Following the discussion on this paper, Mr. Long appointed the Nominating Committee to be composed of E. L. Smith, Towanda, chairman, A. J. Althouse, Hamburg, and A. R. Granger, Chester, and the Auditing Committee, H. R. Kern, Philadelphia, chairman, E. D. Dreyfus, Pittsburgh, and J. E. Shute, Altoona.

Opening the Thursday morning session, J. Grant DeRemer presented a

paper on "Opportunities for Central-Station Steam Heating Development."

This paper is a statistical analysis of the results to be obtained from and the benefits accruing to the central station supplying steam-heating service for commercial purposes. Mr. DeRemer, who is an acknowledged authority on this branch of engineering, draws a striking analogy between the thermal conditions under which a steam locomotive is operated and that under which an electric central station operates, the former being no better than 10 per cent efficient thermally and the latter little better with about 15 per cent. For the steam railroads there seems little hope of reducing this enormous waste except by electrification, but for the steam electrical stations, the effective remedy lies in district steam heating. Anticipating the question as to the ability of the country to consume the large amount of heat which must be disposed of to render the sale of this by-product profitable, the author shows that an annual heating revenue of $100,000,000 is possible in the United States. But steam-heating systems must be treated with the same careful commercial management and technical analysis that is brought to bear upon electrical problems. Due consideration must be given to the efficiency of the underground distribution system; to the nature of the business available; to the form of contract for service; to the method of charging; to the rate schedule, and what is most important, the business must be solicited instead of waiting for it to come forward of its own initiative.

Mr. Hobbs, Pittsburgh, in opening the discussion, took exception to the author's assumption that 75 per cent of the steam-electric output in the United States during 1912 was non-condensing. He also said that investors want a return on their investment for 12 months in the year and not six months, which is the heating period in this climate. In terms of conservation, steam heating is a good proposition, he said, but financially it is another matter.

In answer to a question by Mr. Kenney, as to the rates charged for steam heating, Mr. DeRemer said that only a meter rate should be considered and that it should be made large enough to provide a considerable factor of safety for contingencies. He also said that in summer, the steam-heating company should work up the hot-water business as gas is about twice as costly. The maintenance of an underground distribution system comes to $500 per year and the author emphasized the fact that the division of costs on the books between the steam heating and the electric functions of a station should be fair.

The next paper was the "Protection of Distributing Transformers Against Lightning," by R. T. Wagner.

The author takes pains to assert at the outset that lightning protection should be thought of in the sense that the wise doctor will advise a patient as regards analysis of past troubles, remedies for existing conditions and prophylactic measures for the future. It is true that burned-out transformers and blown fuses cost money in repairs and replacements, but this expense is relatively unimportant when compared with the loss in prestige caused by interruptions to service. In tracing out the purpose of arresters and their applications to generating stations and transformers, the author dwells at length on the prime importance of properly installing arresters on the lines and strongly advocates the practice of installing the arresters on the same pole with the transformer. In this connection, the importance of proper grounds was pointed out as the foundation for successful lightning arrester operation. In summarizing, the following points should be borne in mind when installing arresters: Separate and thoroughly reliable grounds should be made for the arresters and secondary neutrals. The arrester grounds should be of low impedance, the secondary grounds of low resistance. Lightning arresters and all grounds should be inspected at regular intervals, particularly just before and after the lightning season. To obtain the best protection the arresters are capable of giving, they should be installed at the terminals of the apparatus to be protected.

H. N. Müller read a written discussion of the paper from C. C. Long, Reading, in which was compared the suggestions made in the paper with the practice as developed by Mr. Long's company.

E. E. F. Creighton of Schenectady, N. Y., was then given the floor and with the aid of apparatus capable of delivering a pressure of 120,000 volts at 300,000 cycles per second, several insulators were tested for breakdown and performance. Prof. Creighton said that there is no complete solution of the lightning problem but that the state of the art has improved to such an extent that perfection is not far removed. There are three problems encountered in this work. First, the manufacturer's problem; second, the operation of the line; third, the insulator problem which is between and overlapping the first two problems. Lightning is of a high voltage and of short duration; therefore, the insulators which are supposed to withstand the stresses of lightning should be tested at that voltage for that duration of time. If the insulator tested under those conditions does not break down within a minute or so, it will not fail at all, tests have shown. Experiments were then shown in which a plain strain insulator without petticoats, a perfect strain insulator with petticoats and a defective insulator were used to show the action of the discharge in each case. In answer to a question by H. N. Müller, Pittsburgh, Mr. Creighton said that the amount and quality of the glazing on the insulator is of little importance from the standpoint of performance.

J. M. Wakeman, general manager of the Society for Electrical Development, followed with a short talk on the coming Electrical Prosperity Week. He outlined the parts to be played by all having to do with electrical matters to help make the week a success and predicted for it the greatest trade revival the world has ever known. Literature on the subject was distributed among the members present.

The next event on the program was two papers on the suject of "Efficiency of Boiler Room Methods," by H. B. Bryans and J. C. Scholl.

Messrs. Bryans and Scholl in their respective papers on this subject, give the results of their experiences in working out methods of boiler-room practice for the object of increasing the efficiency of their boilers and grates and reduce production costs. It was realized at the start that the most important factor in boiler-room efficiency is the workman, and consequently a large part of the study was aimed at a reduction of the waste of human energy and the establishment of conditions favorable to the worker Nor was this considered sufficient, but an effort was made to stimulate the interest of the workers by making them actual participants in the savings effected. The experiments were made at a hand-firing plant and the several parts tending to make an efficient whole, such as co-operation, methods of firing, boiler efficiency meters, flue temperatures, water purification, routine work and records are taken up and discussed in turn. A fac-simile of a daily power-plant report is shown and the results of ten average days of operation are given in some detail. Mr. Bryans states, in conclusion, that all of the scientific apparatus that can be thought of will not be worth the room taken up if the proper amount of supervision and attention, both on the part of the executives and workmen, is not given.

A rather interesting discussion followed these papers. Mr. Gray explained the instruments used to attain boiler-room efficiency, but insisted that the selection of the boiler-room employees is most important. Details of practice differ in different plans. However, there are some of these practices

that are common to all. He argued against the bonus system, saying that it should not be necessary to pay a bonus to a workman for doing his duty. In conclusion, he made a plea for standardized boiler-room practice.

G. E. Wendle, Williamsport, advised that in all work of this sort, a clear idea should be had of the limitations in respect to the money wherewith to pay for the changes to be made. Mr. Hobbs, Pittsburgh, stated that co-operation between the men and the executives is the keynote of the whole situation.

The executive session was held on Thursday afternoon. George E. Wendle, chairman, presented the report of the Engineering Committee. The work done by this Committee during the past year has been almost entirely devoted to investigations, analyses, etc., in connection with the specifications for overhead wire crossings, suggested by the Public Service Commission, and was undertaken by a joint committee composed of representatives of the steam railroads, electric railways, telephone and telegraph companies, and the electric light and power companies. The report is quite a complete compendium of information, mathematical deductions and curves of conductor sags.

Chairman R. S. Orr, Pittsburgh, made a verbal report for the Special Committee, as did Chairman George B. Tripp, Harrisburg, for the Rate Committee. Following these reports, a paper entitled "Relations Between Electric Utilities and Their Customers" was given by J. Fred Schaffer, of Sunbury, which occasioned much discussion among the members.

B. Lester delivered his paper on "The Use of Small Motors on Central-Station Circuits" at the session on Friday morning.

This paper is profusely illustrated with cuts showing various applications of fractional horsepower motors for almost every conceivable use. The author treats his subject from the standpoints of purpose of using small motors, benefits to the central stations and the best methods of analyzing the possibilities and pushing the sales of such machines, and following this outline, proceeds to take up the most important uses now being made of small motors in home, office and store. The principal benefit to the central station from the use of fractional horsepower motors on its lines comes from the sale of current largely at the time of off-peak load. The small motor-driven machine has very largely followed the path of electric light. The benefits derived from any central station are similar to those coming to any manufacturer as he increases the production of his established plant, i. e., an increased volume of production, with comparatively small increase in overhead expense or permanent investment. The problem, therefore, which central stations meet in pushing this class of load is a problem of intensification rather than entirely new development and the key to the situation is in getting the public mind to realize that the small operations done by hand are the ones that require so much valuable time and can be largely eliminated by the use of reliable, clean and cheap power-producing units.

Stephen C. Pohe.

Stephen C. Pohe was born August 8, 1885, at Espy, Columbia County, Pa., and received his early education at Catawissa, attending public school. He then studied at the Potts Business College, in Williamsport, Pa., from which he graduated in 1902, going to Berwick, Pa., where he entered the office of the Berwick Light Company, in time becoming assistant to the manager, L. J. Townsend. Upon the latter's death, in 1907, Mr. Pohe was made manager of the company, holding that position for eighteen months; in January, 1909, the company was merged into the Columbia Power, Light & Railways Company, of Bloomsburg, Pa., and Mr. Pohe was made superintendent of new business, with offices at Bloomsburg, which position he held until September, 1910, when he was elected general superintendent. During the year 1912 a controlling interest in the property was purchased by H. D. Walbridge & Company, of New York City; the company was reorganized, the gas and electric properties under the name of the Columbia & Montour Electric Company, and the railway properties as the North Branch Transit Company, Mr. Pohe becoming general manager of both companies. In November, 1913, the Walbridge interests acquired control of the gas and electric properties of the Northumberland County Gas & Electric Company, operating in Sunbury, Selinsgrove, Northumberland and Milton, Pa., and at that time Mr. Pohe was made general manager of that company also, with offices in Bloomsburg. Mr. Pohe is a member of the American Institute of Electrical Engineers and the Jovian Order.

In answer to a question propounded by H. N. Müller, Pittsburgh, Mr. Lester stated that a motor device has been placed upon the market to produce a forced draught for hot-air heating systems, thus enabling the heat to be spread more uniformly throughout the building.

A very interesting discussion took place on the subject of the "Handling of Cases Involving the Theft of Current." In a written discussion, J. B. Seaman, Philadelphia, enumerated methods which have been used to steal current or retard the action of the meter. He advised the practice of running service wires in iron conduit, so arranged as to permit of easy inspection and that the distance between the end of the service and the meter should be as short as possible. The service fuses should always be inclosed in a box and sealed. A standard practice of grounding should also be adopted, in order that the discovery of an installation different than the standard decided upon will excite suspicion. In brief, the detection of theft of current requires eternal vigilance.

R. W. Hoy, Harrisburg, said that an expert was now making a complete investigation in the territory served by that company, in order to determine the extent of theft of current. He stated that stealing of current is mostly practiced in the disreputable saloon districts, on the premises of customers cut off for non-payment of bills, and in boarding houses. Mr. Hoy strongly advocated that services should be removed after the meter is removed.

G. E. Wendle, Williamsport, inquired as to what is considered sufficient evidence in prosecuting cases of theft of current, and Messrs. Walburn and Rockwell, of Pottsville, and Mr. Long, of Scranton, endeavored to illustrate, by means of concrete examples. Most of these actual cases were settled out of court.

A paper by S. H. Blake on "Electrically Operated General Utility Services" was then taken up.

This paper aims to show the great possibilities still existing in the field of general utility devices and the most effective methods of exploiting the advantages of electricity in operating them. Electric service in the home while not regarded as a luxury in this country at least, yet it is not considered by everyone as being absolutely necessary, and the fact remains that there are many more homes without it than have it. The work of educating the public concerning the benefits to be obtained by the home use of electricity must be carried on by those who are vitally interested in the growth and success of the industry. Company display rooms, special campaign sales, mail advertising, attractive show windows, judicious newspaper and trolley advertising and other ways of advancing information on the subject are mentioned and the proper methods of executing these arrangements to the best effect are enlarged upon. A partial list of the most attractive devices from the central-station standpoint are given with brief comments on the part each contributes to the revenue of the

company. The author notes that no one can predict what the future holds, but judging from past accomplishments there are many more things that can yet be done to advantage electrically, and each new marvel will tend to advertise and extend the use of electricity.

Following this paper W. H. Acker presented his paper on "Factors Entering Into the Supplying of Rural Communities from Adjacent Central Stations."

In entering upon a consideration of this subject the author arbitrarily considered "a rural community" as being a settlement or collection of inhabitants number from 100 to 1,000 persons and located within a radius of one-half to three-quarters of a mile, and generally not incorporated. After tracing the change in conditions due to the advent of high-potential alternating-current transmission and its advantages for the economic distribution of electrical energy, the statement is made that, broadly speaking, at the present time the supplying or not supplying of service to rural communities is merely a matter of the amount of revenue to be derived and the cost of service. In order to make the service of such communities profitable it becomes of the utmost importance that the cost of the necessary construction is kept at a minimum, while at the same time the construction must be substantial so as not to mitigate or detract from the adequacy and reliability of the service. The author goes on to enumerate the various details of construction of such a line and mentions the factors to be taken into consideration in choosing the methods calculated to best attain the desired end. One of the deciding points in serving a district of this kind is the cost of right-of-way. There are several ways to overcome this handicap, among which are mentioned an agreement with the prospective consumers to provide pole-line rights, or occupying the poles of telephone or other companies already in the field. In conclusion, the author cites the method of running bare line wires to decrease the first cost, since insulation merely serves to limit the short-circuit current due to the accidental crossing or grounding of the conductors, while by proper spacing this trouble could be counteracted and a saving of from 30 to 40 per cent in copper could be effected and strains correspondingly decreased.

President Long then introduced Chairman W. D. Ainey, of the Pennsylvania Public Service Commission, who spoke not on the policies of the Commission, but of certain impressions. He congratulated the utilities of the state for their contribution to the welfare of the state, and especially their demeanor in dealing with the public. Mr. Ainey declared that the Public Service Commission invites the hearty co-operation of the utilities, not in reference to the compulsory side of the law, but to the conference and advisory side, and the doors of its offices are always open, especially to the smaller companies, in order to improve the relations with the public. The experience of the utilities must be drawn upon and the Association rather than the Commission must formulate standard practices for the guidance of the Commission. In closing his very interesting talk Mr. Ainey made a sincere plea for co-operation with the utilities in order that the public may have the benefit of their experience.

Chairman H. R. Kern, Philadelphia, of the Auditing Committee, reported that the accounts of the treasurer were found correct. Chairman F. M. Noecker, Renovo, of the Committee on By-Laws, reported that the Committee recommends the necessary changes to the by-laws, whereby a permanent secretary can be employed and chosen by the Executive Committee in line with the suggestion made by President Long in his opening address. Both reports were adopted unanimously. Several resolutions were here adopted, after which Secretary Müller read the selections of the nominating committee, which were elected as follows:

Stephen C. Pohe, Bloomsburg, president.

George B. Tripp, Harrisburg, vice-president.

Henry N. Müller, Pittsburgh, secretary-treasurer.

For Executive Committee, Ernest H. Davis, Williamsport; E. B. Greene, Altoona; F. M. Noecker, Renovo.

After a few appropriate remarks by the outgoing and incoming presidents the convention was adjourned sine die.

Electric Club-Jovian League of Chicago Resumes Weekly Meetings.

The regular weekly luncheon meetings of the Electric Club-Jovian League of Chicago were resumed on September 9, an entertainment program being provided for the occasion. Victor H. Tousley, vice-president, presided in the absence of President Pinckard.

Homer E. Niesz, Jupiter of the Jovian Order, outlined the plans for the forthcoming annual convention, which is to be held in Chicago, October 13 to 15, and asked for the support of the entire local industry. E. W. Donoho, chairman of the Jovian Membership Committee in Chicago, spoke of the rejuvenation which is to be held during the convention and stated that team and individual prizes will be awarded for securing applicants.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

Eighth Annual Convention Held at Portland, Ore., September 8-11.

The eighth annual convention of the Northwest Electric Light and Power Association was held at the Multnomah Hotel, Portland, Ore., September 8 to 11. It was characterized by excellent papers and reports, animated discussion and a good attendance, the registration being 190. There were a number of attendants from California and from the East, the latter including President E. W. Lloyd of the National Electric Light Association, with which the Northwest Association is affiliated.

The first session was called to order at 10:30 a. m. on Wednesday by Franklin T. Griffith, of the Portland Railway, Light & Power Company, who referred to the objects of the Association. These are not only the welfare of the member companies, but that of the communities which they serve. This will be brought about by the increased use of electricity. It is necessary for the companies to increase their efficiency and to gain the confidence of the public.

He then introduced H. R. Albee, mayor of Portland, who made an address of welcome. He referred to the misunderstandings which often arise between the public and the public service corporations, and said that an effort should be made to dispel them.

President's Address.

O. B. Coldwell then delivered the presidential address, which discussed the working organization of the Association, the character and scope of the work done, public policy matters, relations with the national association, topics affecting light and power companies, valuations for rate-making purposes, efficiency methods, electric cooking and water heating, Electrical Prosperity Week, the use of electricity in schools, water-power problems, and ended with recommendations for future work.

Relations with the national association have been improved, and the appointment of more Pacific Coast members on committees will lead to fuller consideration of the problems of the Pacific states. Relations with contractors have been greatly improved.

With reference to valuations, he pointed out that most of the companies were started before the problems of regulation came up, and franchise values were at that time recognized as a property right. There is as yet no definite method of valuation recognized and the result obtained depends largely on the point of view of the person making the valuation. Before new prin-

ciples are applied to valuations time for adjustment should be permitted. To neglect intangible values entirely at the present time would do harm to the communities as well as to the companies affected.

He emphasized the importance of school instruction in the applications of electric energy.

He pointed out that great water powers are running to waste while fuels are being consumed, on account of the restrictions placed on use by the federal departments. There is as yet no workable statute under which investors will proceed with developments. Sane legislation is needed to this end. A conference on water power is to be held in Portland, September 21 to 23, at which delegates from the different states will frame recommendations to Congress.

He recommended a closer tie between member companies and Association officials; that the smaller companies take a more active part in the work of the Overhead Line Committee; that national officials and committeemen from the Northwest keep in touch with the local secretary; that a committee be appointed to assist school boards and other educational bodies.

E. G. Robinson then offered a resolution advocating legislation on the subject of water power which would permit development. This was referred to a committee consisting of Mr. Robinson, L. A. McArthur and H. L. Bleecker, as were also a resolution by J. E. Davidson recognizing the need of electrical instruction in schools and offering the services of the Association in assisting applications in school work, and one by A. C. McMicken endorsing Electrical Prosperity Week.

E. W. Lloyd, president of the National Electric Light Association, was then introduced and made an address. He said that in the past there had been some dissatisfaction on the Pacific Coast with the Association, due largely to a lack of participation of those members in its affairs, but this year the needs and problems of the Coast will receive full consideration. Heretofore there has been no general effort for geographical representation. He thought the sections should take up their own local problems. The West has its own problems, such as water power and its use in developing the natural resources of the country. Such problems as the application of power to electrometallurgy should be pushed. He then referred to changes in the organization of the national association. The Hydroelectric and Technical Sections are being combined, a Manufacturers' Section will be formed and will handle questions of standardization; an Accounting Section has already been launched; the Commercial Section is very active and has organized a correspondence school. This sectionalization of the work means greater co-operation by a larger group of men.

L. R. Alderman, superintendent of schools in Portland, then made an address, inviting the members to visit the trade schools where the boys use electric current in the shops and the girls in cooking. The schools need the advice of electrical men, and the electrical companies need men with a vocational training. The greatest progress in a wider use of electric energy will come through the instruction of the young.

H. T. Matthew, of the Society for Electrical Development, Incorporated, then explained the purposes of Electrical Prosperity Week and the plans for their accomplishment. The details must be worked out locally.

Secretary E. H. Le Tourneau read a letter from the Jovian Convention Committee, inviting all to attend the annual Jovian convention to be held in Chicago, October 13, 14 and 15.

Serving Small Customers.

At the session on Wednesday afternoon, Hugo E. Eisenmenger, of Cleveland, O., presented a paper entitled "The Small-Consumer Question."

This paper pointed out that the central stations of this country do not have the proportion of small consumers customary in Europe. The value of the small consumer was illustrated by comparison with other public-service enterprises. The reason this class of customer has not been solicited by the central station is the excessive cost of serving him. This cost is made up of three parts: (*a*) Fixed charges on the investment. (*b*) Cost of meter reading, repairs and calibration. (*c*) Billing, collecting and accounting. This cost can be greatly reduced by using a flat rate, and simplifying the method of accounting. The fairness of the flat rate was justified, since the output cost of serving these customers is a small element. The use of the demand limiter was discussed. The flat rate has the advantages of eliminating disputes regarding bills, makes soliciting easier and securing many customers who afterward are transferred to a meter rate. European practice in this regard is explained and a system of accounting and collecting suitable to such a flat rate is described in detail. This method will be fully described in another issue.

Other parts of the paper are devoted to a proper determination of the flat-rate charge, with consideration or different charges for the summer and winter months; suggestions for the wording of a flat-rate schedule; the financing of the small consumer, and reduction of the cost of wiring by the use of the concentric system or similar methods which have not heretofore been in vogue in this country.

The discussion was opened by H. J. Gille, of Seattle, Wash., who said that the conditions which make this form of rate especially suitable do not exist on the Pacific Coast. In this section of the country about 90 per cent of the residences and flat buildings in cities already use current and 80 per cent of these use electric irons. In Seattle flat-rate customers represent about 10 per cent of the total income. All of the companies are anxious to get the small customers.

F. O. Broili, of Portland, had found that most flat-rate customers with limiting devices soon changed to another class of service.

S. V. Walton, of San Frencisco, stated that the Pacific Gas & Electric Company had started with a flat rate in Sacramento and would like to abandon it, but cannot do so now. The author of the paper assumes a high density of population with low purchasing power. Such conditions exist in Europe and perhaps in some American cities, but are not the general rule here. Most people in the Western States can secure electric service on the usual terms if they desire. The assumed consumer cost of service is larger than he has experienced, in proportion to other costs. In agricultural districts his company has sometimes billed only once a year, which reduces this element of the cost.

E. G. Robinson, of Arlington, Wash., stated that his company has about 90 per cent flat-rate customers. Neither he nor the customers like the flat-rate controller, which does not reduce the demand at peak hours. Electric irons on his circuits do not bring any revenue, now, but will do so whenever a change is made to a meter rate. The system described may be suitable for Europe, but for this country can be regarded only as a device for getting customers on the lines.

C. J. Edwards, of Tillamook, Ore., agreed with the previous speaker in part, but thought the methods described in the paper could be used to get small consumers. He did not approve of permitting the free use of electric irons, as trouble would be experienced when a change is made to a meter rate and the bills increase.

E. W. Lloyd, of Chicago, said that the Commonwealth Edison Company had paid a big price for handling the small consumer, averaging 46 cents. In studying methods to reduce this cost it has been found that service costs more than energy and this would be even more true in the West. He advocated a cheaper system of wiring, provided it is safe. The cost of indoor installation is usually out of proportion to the cost of service connection. Central-station men should work for cheaper methods.

W. M. Hamilton, of Salem, Ore., favored the flat rate as an entering wedge, but had not found it satisfactory unless a flat-rate controller was used. This form of rate eliminates complaints of high bills and is an asset against municipal ownership. Customers are usually satisfied with a higher total bill on a flat rate than with the fluctuations on a meter rate.

A. C. McMicken, of Portland, suggested that the effect of a flat rate on the diversity-factor is probably bad.

In closing the discussion, Mr. Eisenmenger said that in Milan, Italy, customers on the lowest rate soon changed to a large installation. Tests there show from 1,000 to 2,300 hours of use of the demand per year. In the illustration used in the paper, 2,200 hours had been assumed, so that the rate would not likely cause any loss to the company. A deterrent to waste of current is the cost of lamp renewals, and the use of high-efficiency lamps was advocated. A different charge in summer and winter months is sometimes urged because there is a similar difference in competitive illuminants. Life tests of flat-rate controllers have given results of one hundred to several thousand hours, according to the current used and the construction. One make tested seemed to have an indefinite life.

Analysis of Cost of Business.

J. A. Rockwood then presented a paper entitled "Apportionment as Applied to Analyses of Cost of the Light and Power Business."

This paper discusses the apportionment for rendering service to different classes of customers. The principles underlying correct apportionment are first discussed and the apportionments then taken up under the following heads: Operating expenses, including repairs, divided into generation costs, transmission costs, conversion (or transformation) costs, distribution costs, utilization costs, commercial costs and general costs; insurance; injuries and damages; taxes; investment; depreciation. Data were given from actual steam and hydroelectric operation, which show that except for fuel and oil the operating expenses are not proportional to output. Consequently the other operating expenses are apportioned in the same proportion as the investment. The latter is apportioned according to the responsibility for the investment. This responsibility is not in proportion to the maximum demand, but to a modified maximum demand which takes into consideration such factors as time of peak and duration of load. An example to illustrate this is given. Most expenses can be directly charged to the class of service for which they are incurred and general expenses are assigned in proportion to the directly assigned operating expenses. Depreciation is assigned in the same proportion as the investment. In conclusion, it pointed out that it is an essential part of the business to know what each part of the business costs and that public service commissions are constantly making such analyses and basing their decisions upon them. Two extremes should be avoided; one is an attempt at too great accuracy and the other that of making assignments without the necessary fundamental information.

G. E. Quinan, of Seattle, opened the discussion. He said that the apportionment of expenses is not at all settled as yet, but closer study is giving trustworthy cost figures. Reasonable accuracy can be obtained without great complexity. He questioned the author's method of apportioning the investment. The modified demand is a rather complex index and may need redetermination from time to time. He offered another scheme in which the investment is divided into two parts, one representing the cost for the same total consumption at unity load-factor, and the other the excess cost above this amount. The first part could be apportioned in proportion to either demand or consumption; the second part in proportion to a responsibility factor, depending on the excess of the demand over the average. This would involve weighting. This scheme could be applied to transmission, transformation and distribution costs.

C. B. Aitchison, member of the Public Service Commission of Oregon, pointed out the importance to utility companies of cost apportionments. These are necessary for the proper conduct of the business, and also on account of the public relations with the patrons. Without cost figures it cannot be known whether an adequate return is secured from any particular class of business, and it is not possible to justify rates which discriminate between different classes. The public has come to believe that charges should be based upon costs, and recent decisions of the United States Supreme Court require each branch of the business to yield a reasonable return. Apportionment cannot be exact when the demands are only approximated, but there may be substantial accuracy with simplicity. The method used should not involve any great mathematical complexity. The final result must be such as to represent in the broadest sense the greatest service to the community or the resulting rates cannot survive. He thought investment charges should be distributed according to benefits rather than according to responsibility for the expense.

S. V. Walton, of San Francisco, said that the paper brought out in a definite way what it is often necessary to explain, by pointing out that light is more of a luxury than electric power and is worth more. He said that load-factors must be improved by serving electrochemical industries, etc. In one instance he had found that a better rate could be made for 24-hour service than for a load used only between 10 p. m. and 6 a. m.

P. N. Jennings, of Seattle, emphasized the importance of value of service in competing with isolated plants.

Henry L. Gray, of Seattle, had found it necessary to apportion expenses in different ways in dealing with different utilities. He agreed with the author on most points and emphasized that operating expenses are never porportional to the output in hydroelectric plants, except for the items of oil and lamp renewals. The investment cost is a large item, and is sometimes proportional to demand, and in other cases, as where a reservoir is necessary, depends upon output. He had found the results not much different with different bases of apportionment.

An evening session was held at the steam power station of the Portland Railway, Light & Power Company on East Lincoln Street, the company supplying special cars to conduct the members and guests to the plant. A paper was presented by E. V. Searing entitled "Special Features of Stand-by Steam Power-Plant Design and Operation."

This paper gives a brief description of Steam Station "L" of the Portland Railway, Light & Power Company, and also outlines the general method of operation. Attention is called to the special features of the station which were embodied in the design, and particularly to the various meters installed and their use in giving accurate records of daily performance. A number of photographs of special and general features and records of performance are reproduced.

After the presentation of this paper an inspection of the plant was made, followed by music, dancing and refreshments.

Overhead Line Committee.

President Coldwell called the session to order on Thursday morning, and the report of the Overhead Line Committee was presented by the chairman, J. C. Martin.

This report considered the situation in the Northwestern States with respect to overhead line specifications, the problems presented by the adoption of rules by the California Railroad Commission governing the construction of lines where inductive interference exists, the probable effects of the adoption of certain requirements in the specification of the National Electric Light Association, and the proposed

National Electric Safety Code which is being prepared by the Bureau of Standards. The specifications adopted in Idaho have been drawn up with the conditions peculiar to this territory clearly in mind; no essential safety requirements are omitted, but detailed requirements have not been gone into. The use of distribution voltages above 5,000 volts has been recognized. Regarding the inductive interference rules of the California Commission, a quotation is given from the report of the High-Tension Transmission Sub-Committee of the N. E. L. A., pointing out that the ultimate effect may involve impairment of service, increase in hazard, and general hardship to the power companies; and that the spirit of the ruling puts the entire cost upon power companies for the benefit of the telephone companies. The committee has worked with the N. E. L. A. Overhead Line Committee in avoiding the danger to development which might be involved in the adoption of specific requirements. The far-reaching importance of the safety code proposed by the Bureau of Standards is pointed out, since it provides a detailed construction specification, which may be made mandatory by regulatory commissions. It would be more universally enforced than the National Electrical Code, since the latter can be ignored when it is more economical to carry one's own insurance. Study and discussion of the proposed code is advocated.

E. W. Lloyd proposed that the Northwest Association select a man for membership on the N. E. L. A. Committee on Accident Prevention.

A. Emery Mershon, of Fresno, Cal., explained the status of the California rules. The committee which recommended these rules for adoption by the Railroad Commission included representatives of the power and telephone companies, as well as of the Commission. The ruling was not entirely satisfactory to either set of utilities, and has not yet been fully enforced. The committee is still working on the problem, and the final report will not be submitted for some time. The telephone companies are making few demands at present.

E. G. Robinson, of Arlington, Wash., said that in his state power lines are erected principally on the public highways and a similar ruling there would make development almost prohibitive so far as small communities are concerned. In some cases telephone wires are already erected on both sides of the road.

S. V. Walton, of San Francisco, said that many of the lines in California are on private rights of way, but fully 50 per cent of the bay lines are either on highways or adjacent to them, and these have given the most trouble.

L. T. Merwin, of Portland, said that a reasonable attitude toward the telephone company would generally result in an easy solution of difficulties and gave examples to confirm this.

In closing the discussion Mr. Martin referred to the bitter criticism of the California rules at the convention last year. He said that the telephone companies had gone to considerable expense in moving their lines before demanding that the power companies take steps to avoid interference. The rules in California probably seemed best for that state, but the probable interpretation of such rules in this territory would not be satisfactory.

M. C. Osborn then took the chair while H. B. Peirce presented a paper by himself and L. N. Simpson, entitled "Development of Small Motor and Appliance Load."

Development of Appliance Load.

This paper discussed the methods for obtaining a greater use of electric energy by appliances in residences. The energy consumed by such devices often rivals that used for lighting. The paper gives reports from a number of companies to questions affecting this type of load. It is generally found that the output is increased but the peak load not increased by the use of such devices; in other words, they represent an off-peak load. It is advised that only a few, rather than a large number of appliances be introduced at one time, so that the sales force can be completely familiar with them. The importance of a standard universal plug is emphasized and it is suggested that this matter be taken up with manufacturers; also that small motor bases up to one-sixth horsepower should be of a universal type with uniform bolt holes. Most household devices are sold to women and the appeal should be made to them. There are three classes: (1) those having servants, (2) those with reasonable incomes but preferring to do their own housework, (3) those that must economize and necessarily do their own work. The first class is small and they must usually be seen in their own homes. The second class will attend demonstrations and are the easiest to reach. They usually prefer payment by monthly installments. The third class buys more equipment than might be expected and eagerly use labor-saving devices when once familiar with them. Consumers may be reached through the salesroom, through solicitors calling at residences and through other dealers. Every central station should have a display room and be ready to supply information. Solicitors calling at the home represent the most expensive method and at the same time the most effective. The encouragement of sales through dealers is recommended and this requires that the central station should sell appliances only at the usual margin of profit. This is nearly as easy as selling at cost. "Feature" methods are discussed and described. Advertising should be done in connection with the national advertising of the manufacturer, using cuts supplied by the latter wherever possible. Rates for heating appliances should, when possible, be made low enough to compete with gas. Opinion is divided as to using a separate meter for heating devices. Many companies use a double-throw switch to control a flat-rate heater for water which makes electric cooking practical. It is suggested that a similar scheme might be used for an air heater for the kitchen for the winter months.

William Spalding, of Portland, pointed out the importance of electric vehicles in load building. There is a great field for this—not only in the large cities, but in the small towns. Social leaders are always prospects for closed passenger cars which yield a revenue of about $4.00 a month at usual rates. Merchants can use 500-pound to 700-pound delivery wagons, two types of which are now available at prices under $1,200, and the operation of which is cheaper than for a Ford delivery car. Electric busses using interchangeable batteries are often possible in towns having no street cars.

M. C. Osborn stated that an electric bus used in Spokane had cost 5.8 cents per mile for all operating expenses after 30,000 miles of use.

Lewis A. Lewis, of Spokane, stated that the Washington Water Power Company, found the profit on appliance sales would pay the overhead costs of keeping a representative in many small towns where it otherwise would not be possible. He gave figures showing that the daily consumption on Tuesdays (ironing day) was larger than the night consumption, and the average daily consumption is almost equal to the average nightly consumption. This indicates the desirability of giving 24-hour service even in the smallest plants. Moreover, the day load shows a better load-factor.

S. M. Kennedy, of Los Angeles, said that the Southern California Edison Company had made a large sale of appliances and built up a large day load. After trying all methods of load building he had found them all slow in comparison with sending solicitors from house to house. This company has a chief appliance salesman and 17 assistants. There is good evidence that the appliances are used after being purchased and they bring revenue at the maximum rate.

This paper was also discussed by S. V. Walton, W. R. Putnam, E. A. Wilcox, A. K. Baylor, H. F. Holland, George A. Hughes and W. H. P. Hill.

Mr. Hughes, of the Hughes Electric Heating Company, entertained the members of the Association at an electrically cooked lunch.

The afternoon session opened with the election of the Nominating Committee, as follows: J. E. Davidson, W. E. Herring, D. C. McKissick, A. C. McMicken and Eugene Enloe.

Determination of Maximum Demand.

A paper entitled "Determination of Maximum Demand," by V. H. Greisser and H. B. Peirce, was then presented by Mr. Peirce. Determination of maximum demand is desirable in fixing charges and in estimating the capacity necessary for the equipment. It may be determined by measurement or by non-instrumental methods. The latter are based upon connected load, weighting of different classes, assessed valuation of property, or floor area to be lighted. The instruments available for measurement are classified as follows: (1) those that integrate the energy over a definite interval; (2) those that continuously show instantaneous power; (3) those that register a demand regardless of duration. The different classes of instruments were discussed and it was pointed out that graphic instruments give the most reliable information but also require the most attention. Each type of instrument gives greater satisfaction in measuring certain types of load. When all the limitations surrounding the determination of individual demands are considered, it seems good commercial policy to consider only class demands in determining rates.

An exhibit of instruments for determining maximum demand was made by the authors.

Stacy Hamilton, of Salem, Ore., pointed out that it is illogical to seek high accuracy in the measurement of output, and neglect demand, which is just as important an element of cost. Measurement of the latter, however, is more complicated. For small customers it is satisfactory to take a definite percentage of connected load; for large customers the demand should be measured. The time and the duration of the peak should be considered. This can be done by the modified demand as used in Mr. Rockwood's paper. Some method of measuring demand should be standardized.

A. E. Mershon, of Fresno, said that it is impossible to standardize the measurement of maximum demand, since different methods are desirable for different types of load; but standardization for a single class might be accomplished.

S. V. Walton read a discussion by one of the engineers of the Pacific Gas & Electric Company favoring different types of instruments for different forms of load. Graphic records are most accurate but are not convenient for general use. Demand charges should be based upon kilovolt-amperes rather than kilowatts.

E. W. Lloyd said that non-instrumental methods lead to trouble. In Chicago the power demands over 20 horsepower are now measured, as are lighting loads exceeding one kilowatt. Manufacturers have been slow in producing suitable meters for this purpose because they did not know just what was wanted by the central stations. The latter should experiment with demand meters and encourage development by using them. The data compiled by his company on load-factors during the past 15 years is invaluable.

Modern Illumination.

A paper entitled "Practical Application of Modern Illumination," by F. H. Murphy and G. A. Kumler, was then presented by Mr. Murphy. This paper took up the discussion of illumination units, the general principles which are more or less applicable to all lighting installations, a discussion of reflectors and lamps for different types of installations, the steps to be taken in the design of the installation, with examples illustrating the use of various tables and curves included in the paper. Emphasis was laid on the necessity for efficiency, comfort and artistic harmony in lighting installations.

W. M. Hamilton complimented the authors for the excellent collection of available data which they had compiled. He favored the useful foot-candles of illumination on a given working plane in comparing different lamps, rather than considering the total lumens generated. He emphasized the importance of considering visual efficiency as distinguished from physical efficiency, and the importance of avoiding glare. Eye strain may be due to too much as well as to too little illumination.

W. D. Peaslee, of the Oregon Agricultural College, emphasized the rapid deterioration which may result from dust collecting on reflectors. In the case of one room where blackboards were used the deterioration amounted to nearly one-half in 30 days. He considered it inadvisable to use arc lamps for street lighting in small towns unless there were enough to keep one lamp-trimmer busy.

The session ended with a talk by Miss Vera Dickson, of the Public Library Association of Multnomah County, on the development of public library work, with special reference to technical literature.

Group at Northwest Convention—Left Half.

On Thursday evening an illustrated lecture was given by Henry Berger, Jr., entitled "The Art of Natural-Color Photography". Views were given of Portland, the Rose Festival, the Columbia River Highway, Mount Hood, Crater Lake and other interesting features of the surrounding country.

The meeting on Friday morning was called to order by President Coldwell at 9:30 o'cloock and the report of the Electric Range Committee was presented by the chairman, W. R. Putnam.

Report on Electric Ranges.

This report consisted mainly of a compilation of answers by central stations in all the Western States to questions sent out by the committee. These answers covered rates, policies, and statistics regarding the electric-cooking and water-heating loads. Comments of central-station officials, public service commissioners and manufacturers were given, as well as extracts from other papers and reports concerning the subject. The committee compiled a number of curves showing the estimated effects of a range load, as well as some actual records of operation. The committee also discussed the data collected and reached the following conclusions. Securing of this business depends upon suitable rates, moderate-priced and efficient equipment, and an active publicity and selling campaign for central stations and manufacturers. Electric cooking cannot compete with fuels on a cost basis, but only on account of its inherent advantages. A block rate with high minimum, using a single meter, was advocated. Water heating should be restricted to night hours, or all hours when the range is not in use. To introduce ranges, central stations must do the bulk of the selling on time payments. As prices go down with increased sales, selling prices should be adjusted so electrical dealers can participate in the business. Advertising and publicity work should include newspapers, booklets, demonstration work, and experts to follow up installations.

The committee recommended the appointment of a new committee with sub-committees to cover the following topics: co-operative advertising between central stations and manufacturers; the subject of discounts in merchandising; the collection and dissemination of cooking data; water heating; and rates for cooking and water heating. A motion was passed adopting this recommendation, and the president appointed the following committee: W. R. Putnam, M. C. Osborn, S. V. Walton, A. C. McMicken, S. M. Kennedy and H. J. Gille.

Group at Northwest Convention—Right Half.

Exhibits of Hughes and Westinghouse ranges were made by the manufacturers' representatives.

Mr. Osborn was called to the chair to preside during the discussion, which was opened by Stanley V. Walton, of San Francisco. In spite of the advantages of electric cooking, he said that cost was the most important factor and that it was only in the case of abnormal rates that electric energy could compete with gas on a cost basis. A flat rate is not desirable. A company having a block rate and single meter is the one having the largest proportion of cooking customers.

H. C. Peirce, of Spokane, said that a sliding scale was used in that city and it is hard to determine the exact income from ranges. Comparison with past years indicates an income of $45 per kilowatt-year of station capacity when the diversity is considered. Some customers desire automatic control of ranges, while others prefer the greatest simplicity. The demand-factor on the power station improves as the number of customers increases. This has been demonstrated by the use of recording meters on typical installations. Water heaters connected on a double-throw switch such that current is used only when the range is not in use, are in demand by customers. Water tanks should be lagged—a laced-on type being the most convenient. The size of water heater necessary depends upon the needs of the particular family.

S. M. Kennedy, of Los Angeles, said that in spite of the fact that in his territory electric energy could not compete with gas upon a cost basis, he expected to install a large number of electric ranges. Water heating is one of the greatest difficulties to be met. The high cost of installation will be reduced with increasing extent of use. He favored selling on the same basis as the contractor and dealer, but in breaking new ground it is necessary to do some business at cost or even at a loss in order to set examples. Electric lighting was introduced in spite of the competition of cheaper gas, and the same can be done with electric cooking. Emphasis should be placed upon its advantages. He favored a single meter. In selling, expert salesmen who are truthful and have a good presence are needed.

H. J. Gille, of Seattle, said that distribution cost is often greater than generating cost, and the cooking and heating load placed a peak upon the distributing equipment. He referred to automobiles as an example that cost is a secondary consideration if electric cooking is found the most suitable means to the desired end. Introduction should be easy in territory where gas

is not available. He favored co-operative advertising with the manufacturer.

The discussion was continued at the afternoon session. A. E. Mershon, of Fresno, Cal., said that the sale of the apparatus was the important question and it could be easily effected on time payments.

E. A. Wilcox, of San Francisco, favored a flat rate for water heating, which is an important question in introducing electric cooking. The cooking load represents a large increase in revenue while it represents little increase in investment, at least for hydroelectric plants. He thought that the manufacturers had done more than the central stations in developing the business. Equipment is wanted at a low price, but not by sacrificing quality. It must be serviceable and permanent. Merchandising is a problem of educating salesmen, other company employees, other electrical men, and finally the public.

J. E. Davidson, of Portland, said that rates must depend upon local conditions, but three cents per kilowatt-hour is a fair average. He favored a single meter and purchases on installments. Records of ranges already installed are imperatively needed.

H. L. Walther, of Medford, Ore., has placed 300 ranges in use and the users are good advertisers. The problem is to educate the consumer to the advantages. Satisfied users of water heaters are held in spite of municipal competition. When the irrigation pumping load goes off, electric heating is the only available load to take its place. Farmers utilize this as much as city customers. The only additional investment required is for transformers in certain cases.

Election of Officers.

At the executive session which followed, the following officers were elected for the ensuing year: president, E. G. Robinson, Arlington, Wash.; vice-presidents, Attilla Norman, Eugene, Ore.; E. P. Bacoon, Boise, Idaho; F. J. Roche, Billings, Mont.; and H. J. Gille, Seattle, Wash. Executive committee, M. C. Osborn, J. M. Kinkaid, J. E. Davidson. This committee will appoint a secretary. The place for the next meeting will be Seattle.

A banquet was held at the Multnomah Hotel on Friday evening, at which the principal address was made by C. C. Chapman. The chairman of the entertainment committee was A. C. McMicken.

On Saturday an automobile trip for both delegates and ladies was taken up the Columbia River Highway to Oneonta Gorge, where luncheon was served.

Entertainment for the ladies was provided by a Ladies' Committee, of which Mrs. J. E. Davidson was chairman.

INDIANA ELECTRIC LIGHT ASSOCIATION.

Seventh Annual Convention, Terre Haute, September 8 to 10.

The seventh annual convention of the Indiana Electric Light Association, which was held on Wednesday, Thursday and Friday of last week, was marked by a large attendance of members and guests, and the convention, both from the business and social standpoint was considered by far the most successful meeting that the Association has ever held. The convention meetings were held at the new Hotel Deming, and the excellent accommodations provided by this hostelry through the courtesy of its manager, W. A. Cochran, were commented on by all present at the convention which extended a vote of thanks to Mr. Cochran before its close.

The first session was called to order on Wednesday morning by President T. F. Grover. A cordial address of welcome was made by Mayor James M. Gossom. President Grover than delivered the annual presidential address in which he first pointed out that, despite the very marked depression on all business caused by the war, and the further difficulties arising in the utility business from the attitude of the public toward utilities and the problems connected with commission regulation, the central-station industry has made marked progress during the past year, an achievement that few industries can boast of in these strenuous times. The reports of Indiana electric light and power companies who are members of the Association show an increase in both output and earnings for the year, which is especially gratifying at this time. The efforts made by central stations to urge the use of more efficient lamps, particularly tungsten units, have finally been appreciated by the customers who have taken full advantage of the reduction in cost of lighting and have used current more liberally for this and other purposes. This reduction in cost of lighting has also been the means of adding many new customers to the lines. The continued demand for further reductions in rates is a live matter being carefully considered by the utility companies, who will gladly meet this demand as justice permits. There is probably no other business which can show so decided and steady a reduction in cost to its patrons as the central-station industry and which at the same time has maintained such high standard of service and been compelled to pay increasing amounts for labor and materials. Looking into the future of the industry, Mr. Grover felt optimistic, because it seemed certain that in the not distant future electricity will supersede all other methods for cooking. These and other additions to the load and further improvements in electrical devices augur well for future prospects.

The remainder of the session was taken up with routine business. The reports of the secretary and treasurer showed the Association to be in excellent conditions, both as regards the membership and finances. A recommendation made by President Grover in his address was that the offices of secretary and treasurer be combined, in the belief that the work of these two officers could be greatly facilitated by one individual. This action was taken. Report was made on the membership of the Association, which showed that this total was 105, 67 being active members and 38 associate members; 14 new members were elected, of whom 2 were active members.

A lengthy discussion ensued on the proposition of making the Indiana Association one of the geographical sections of the National Electric Light Association. The Executive Committee was instructed to look into the subject thoroughly, confer with the officials of the National Association and obtain data on the advantages of affiliation with the national body and report back to the next annual convention of the Indiana Association.

The afternoon session was expected to open with an address from Halford Erickson, of the Wisconsin Railroad Commission, the subject of which was to be "Investment and Return"; owing to the inability of Mr. Erickson to be present this subject had to be dropped from the program. A paper entitled "Stability in the Electric Light and Power Industry" was then presented by Frederick Nicholas, of New York City. In this the author gave comparative census statistics showing the progress in capitalization and gross income of various industries. This showed by figures available for the last decade that the electric central-station industry made much greater progress than any other. Data on the returns for the last fiscal year show that continual progress is being made, despite the many hardships which all business has had to contend with. These figures indicate that the central-station industry is one possessing exceptional stability and one which, therefore, should be very favorably situated in the matter of financing. In order to maintain this excellent situation, however, full co-operation between the utility commissions and the utility companies must be assured so that the credit of the central stations may be fully preserved. It is to be hoped, therefore, that no radical measures will be adopted which will be detrimental to the industry at this critical period. In

the discussion which ensued the subject of difficulties in financing central-station companies were emphasized.

A paper entitled "Methods of Determining Maximum Demands for Rate-Making Purposes" was then presented by Emmet Ralston, of the Indianapolis Light & Heat Company. This reviewed the various methods which are used for different classes of customers. In the case of small residence customers data are at hand which permit estimating the maximum with a considerable degree of accuracy. In the case of customers whose load is sufficient to warrant the expense and where the load is of a fluctuating character a demand meter should be installed. In the case of large customers the demand meter may be of the graphic or recording type. The subject was discussed at length and the difficulty usually met in explaining to customers the need of taking account of maximum demand in the system of rates was generally commented upon. Several speakers urged that efforts be made to determine a method of ascertaining maximum demand which will fit all classes of customers. This matter was referred to a committee.

A paper entitled "Some Off-Peak Loads—Charging Electric-Vehicle Batteries," which was prepared by Q. A. Brackett, of the Westinghouse Electric & Manufacturing Company, was presented in the absence of the author by F. H. Nealis, of the Indianapolis office of that company. This paper dealt particularly with the great value to the central-station load curve of vehicle-battery charging, most of which can be done in the hours between midnight and 6 a. m. corresponding to the hours of lowest load. This makes this class of business a particularly favorable one for which off-peak rates can be very properly given. The author discussed the possibility of battery charging, not only for vehicles of the pleasure and commercial types, but also for the lighting of Pullman railroad cars, also the charging of lighting and starting batteries for gasoline automobiles. The most attractive load, however, is in the electric-vehicle business, which the central station should stimulate to its utmost. The methods for boosting the use of electric vehicles were described. The central station itself should be a liberal user of electrics. Taking up the methods of charging the author showed that these almost invariably involve some form of rectifying apparatus to permit charging from alternating-current circuits. The relative advantages of the motor-generator set and the mercury-arc rectifier were discussed. The author showed that in the case of large garages the motor-generator is better adapted than rectifier, but in the case of small garages, such as are called upon to charge starting and ignition batteries only, as well as all private pleasure-car garages, the mercury-rectifier is the better appliance, both from the standpoint of lower first cost and higher efficiency, as well as ease of operation.

Edward J. Condon.

Edward J. Condon, president-elect, Indiana Electric Light Association, was born in Cambridge, Mass., and received his early education and training there and in Boston. When 21 years of age he went to Chicago and became associated with Swift & Company, meat packers, and for five years was in their employ. He then entered the United States Revenue Service, serving three years. He was then appointed superintendent of streets by Mayor Carter H. Harrison, Sr., of Chicago, and served during his term and that of the succeeding mayor, John P. Hopkins. Mr. Condon resigned to take up a partnership in a large construction firm, which built a large part of the City of Chicago water works and sewer systems, conduits for cables, also private gas and electric plants. In 1906 the Condon Construction Company was organized, and has confined its work to engineering, gas, electric and water plants. During his connection with this firm Mr. Condon has personally directed the work of building or rebuilding 31 plants in several states, among which was the City of Victor water works with its reservoir on the west slope of Pikes Peak holding 100 acres of water 12,000 feet above sea level; he also built the Victor Sewer Company plant at Victor, Colo.; rebuilt the Rochester, Minn., gas plant and operated it for three years, the Vilisca electric light plant, Citizens Gas Company plant at Nebraska City, Neb., Harvard, Ill., light and power plant, and the Baraboo (Wis.) Gas & Electric Company plant. In Indiana, he rebuilt the Seymour gas and electric plant, the Madison gas plant, the Boswell electric light and water works plant, and the property of the Waterloo Electric Light & Water Works Company, which latter has been consolidated with the Indiana Utilities Company. This company operates at the present time, supplying current for the towns of Waterloo, Hudson, Ashley, Pleasant Lake and Angola. The headquarters of this company, of which he is president and general manager, are at Angola. In nearly all of the plants with which he has been connected Mr. Condon has had a working financial interest, believing that it results in an advantage to all concerned. He has three sons in the electric business with him; E. J. Condon, Jr., wrote the paper on overhead construction presented at this convention. Mr. Condon is a member of several fraternal societies, a member of the National Electric Light Association, an associate member of the American Institute of Electrical Engineers, and a member of the Central Electric Railway Association. He appears frequently before public service commissions for his own and other companies. He takes a particularly active interest in the utility associations of which he is a member.

Probably the most interesting subject on the program Thursday was the address entitled "Depreciation Reserve" made by Judge J. L. Clark, of the Indiana Public Service Commission. The purpose for which a depreciation fund is set aside, he said, is to prevent the distribution of capital to stockholders as dividends. If the people are willing to and do patronize the business to an extent and at a charge that will enable the concern to operate and lay by a fund for repairs and replacements that will keep the original investment intact, they have a legal right to demand that it be so kept. If it is not so kept the business eventually must fail. Equally is the investor interested in maintaining the integrity of the property, and he has a legal right, where he has made a prudent investment and prudently managed his business, to demand a rate sufficient to keep his investment intact and pay a reasonable income thereon.

When an investment is once made in a utility plant, Judge Clark said, it at once becomes impressed with a public duty, and the public has a right to demand that the investment be kept in the business in order that this public function can be performed. It is a difficult matter to determine whether a case is one for repairs, to be paid for out of the maintenance fund, or of replacement, to be paid for out of the depreciation fund. The imaginary line between the two is one to be drawn in a way arbitrarily, and yet there should not be too much latitude given or the purpose of the depreciation fund might be largely defeated; as, strictly speaking, the whole matter of repairs and replacements is one of depreciation. Judge Clark said that he regards it as good practice to carry an ample maintenance fund and apply it liberally in keeping the plant intact.

It may be granted that the first prerequisite to a depreciation reserve is a rate that will justify such a reserve. The law contemplates clearly a rate that will not only take care of breakage and natural wear and decay, but that will also enable the utility to replace units that are still serviceable with new units of an improved type, and which may better the service rendered. No utility plant is constructed with the thought that it may be operated until the first or any subsequent installment of equipment is worn out, and then go into liquidation, and in the meantime lay by a depreciation reserve sufficient ta pay back to the stockhold-

ers their original investment. No plant could do such a thing. There is much force in the claim that so long as a plant renders efficient service the return should be on the basis of a plant new. One utility plant in Indiana has never been able to carry a depreciation fund, yet its plant is in 50-per-cent condition, and by the prevailing customs in rate-making cases, the return allowed must be on half the value of a new plant; 50-per-cent condition in this case means that half the life of the plant is gone, yet the plant is furnishing first-class service, and so far as the patron is concerned it is 100-per-cent efficient. In such a case the patron should pay a rate as high as he would have to pay on a new plant.

Preston S. Millar, of the Electrical Testing Laboratories, New York City, addressed the convention Thursday forenoon on the subject, "The Incandescent Lamp of 1915." After indicating by a simple comparison with candles the high efficiency of the modern tungsten lamp, he proceeded to discuss the factors which influence the lamp in operation on the premises of central-station customers. By data taken from tests of lamps obtained from various manufacturers through various selling agencies, he showed that the quality of lamps varies largely. With this condition confronting them he urged that central stations control the supply of lamps to their customers, this being the only way in which the quality of the lamps and their suitability for a given service can be assured.

In discussing Mr. Millar's paper, it was brought out that 60-watt gas-filled lamps are now being made in this country and exported. An able discussion of the subject was given by G. S. Merrill, assistant to the chief engineer of the National Lamp Works of General Electric Company. In the course of his remarks Mr. Merrill said that until recently the incandescent lamp has been inherently difficult to control with respect to accuracy of rating. The lamps produced at present, however, will undoubtedly show considerable improvement. As regards the demand for lamps there is a marked seasonal variation and to get a uniform rate of production considerable stock must be accumulated at certain periods of the year. Certain practical difficulties are encountered in getting any improvements or changes in the general market immediately. It is realized by the manufacturers that an improved condition in this respect should be obtained and the standardization of circuits and voltages becomes a subject of considerable importance with the central stations as well as the manufacturers.

Fred L. Dennis, of the Indiana & Michigan Electric Company, South Bend, who has been chairman of the Association's Accounting Committee for several years, read a paper on "Accounting" in which he spoke of the progress being made in this work by the accounting departments.

A paper entitled "Transmission-Line Construction" was presented by E. J. Condon, Jr., of Angola, Ind. This paper dwelt on the rapid increase in the construction of high-tension transmission lines which are connecting the larger with the smaller communities and supplying the latter from large and efficient central stations. When this development originated, cheap construction was commonly adopted, with the result that high depreciation and maintenance is already being noticed in many cases of this type. Mr. Condon was convinced that the supply of electric current to small communities through networks of transmission lines is entirely profitable, if proper attention is given to the construction of the connecting lines. He described the methods followed by the company with which he is associated which has made use of the most approved construction in the belief that substantial construction means not only much reduction in maintenance and depreciation, but a greatly improved standard of continuity of service. In order to avoid making the construction prohibitive in cost, however, much attention is necessary to many details. The practical limit of transmission with a voltage of 13,200 is 15 miles, and, therefore, a transmission potential of 33,000 volts is preferable, the distributing voltage being between 2,300 and 6,600. The common belief that wooden poles are unsuitable for such lines is not warranted, because they are an excellent material for use in lines carrying up to 66,000 volts and transmitting up to 3,000 kilovolt-amperes. By using substantial construction with conductors of high tensile strength it is possible to increase the length of span to 200 or 250 feet, thus reducing the number of poles and insulators required; this calls for more frequent guying, however. Mr. Condon discussed the value of steel towers for some lines. He urged that use of wooden crossarms be confined to the lower voltages; that high-voltage insulators should be selected with very great care; that overhead ground wires be installed over all lines. He discussed the construction of transmission lines built by his company.

A paper entitled "Direct-Current Loads on Alternating-Current lines and Their Value" was prepared by R. E. Russell, of the General Electric Company, but was read in his absence by W. S. Leggett. This paper dwelt particularly on the charging of vehicle and starting batteries through mercury-arc rectifiers and on the supply of direct current for motion-picture theaters. Several methods for aiding in stimulating the electric-vehicle load were mentioned, also the advantages of using the rectifier for charging batteries of such vehicles. This apparatus is also adapted for charging storage batteries used in telephone, railway signal and telegraph service. Since the proper projection of moving pictures requires direct current to get the best results, it is necessary to supply picture houses with rectifying equipment. The author contended that the mercury-arc rectifier is particularly desirable for this.

At the final session the Association's business matters were considered. The Nominating Committee submitted a list of names of officers for the ensuing year. These nominees were elected by acclamation as follows:

President, E. J. Condon, of Angola.

Vice-president, S. W. Greenland, Fort Wayne.

Secretary and treasurer, Thomas Donohue, LaFayette.

Executive Committee, T. F. Grover, chairman, Terre Haute; T. F. English, Muncie; A. R. Holliday, Indianapolis; F. A. Bryan, South Bend; C. C. Perry, Indianapolis.

During the convention a number of entertainment features relieved the strenuosity of the program. On Wednesday evening an informal reception with special music and vaudeville, followed by dancing was held at the hotel. On Thursday evening the annual banquet of the Association was given, at which cabaret entertainment and dancing was included.

The final feature in this line was the automobile trip on Friday to the electrically equipped mines on the west side of the Wabash River. About fifty persons, including a number of ladies, made this trip, which was a particularly interesting one. The party first visited the mine of the Vandalia Coal Company at Liggett, Ind., and then proceeded to the Deering Coal Company's mine at West Clinton. The delegates were taken down into this mine and shown through in a very detailed manner and were greatly pleased at the opportunity of visiting an electrically equipped mine. It is interesting to note that the Terre Haute, Indianapolis & Eastern Traction Company can buy coal in this district, generate current and deliver it to the mines for cutting and hoisting coal and show the operating coal companies a decided saving over burning their own coal under their boilers.

All in attendance at the convention expressed their appreciation of the hospitality of the Terre Haute, Indianapolis & Eastern Traction Company. President Grover, of the Association, who is the Terre Haute manager of this company, made special efforts to provide for the welfare and comfort of those in attendance at the convention.

Trade Papers Adopt Standards of Practice.

"Standards of Practice for Business Papers" were adopted at the Tenth Annual Convention of the Federation of Trade Press Associations held at Philadelphia, September 7, 8 and 9. The keynote of the presidential address delivered by John Clyde Oswald, publisher of the *American Printer*, New York, was "Progress," and the strong recommendations of the committee on the president's address indicate for the coming year a period of great activity for the Federation. Chief among the recommendations adopted by the convention were the appointing of a committee on relations with advertising agencies, a committee to confer with agricultural publications, and a committee to establish definite relations with the manufacturers concerned in the various industries to which the trade publications are devoted. This committee will also confer with the leading manufacturers of the country in working out details of propaganda having to do with great national questions which, through lack of understanding, often work to the disadvantage of industry. The work of the Audit Bureau of Circulations was endorsed and a resolution was passed recording the belief of the Federation that prosperity is to a very large degree dependent on the confidence with which men of enterprise are enabled to view the stability of constructive investment, and therefore the Federation favors complete preparedness for the protection and defense of our country to be established on a permanent basis as rapidly as practicable.

Col. J. B. Maclean, of Toronto, Canada, president of the Maclean Publishing Company, in an address entitled "National Politics in the Trade and Technical Press" reviewed the splendid effect which had been produced in many industries in Canada due to the participation of the business publications in leading thought in an intelligent direction with regard to national affairs.

Charles Whiting Baker, editor of *Engineering News*, of New York, in a paper entitled "A Plea for Promoters," showed how necessary it was for the man of genius in constructive development to receive the unstinted support of the communities in which he chose to operate, and of governmental agencies. The harassment of ill-advised legislation and the restriction of legitimate development are now being reflected in the great volume of unemployment which exists in this country. A more reasonable attitude is imperative if industry is to thrive and intelligent endeavor is not to languish.

Charles W. Price, editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of Chicago, presented a paper entitled "The Service of the Trade and Technical Press." This paper was originally presented to the International Press Congress at San Francisco in July. Mr. Price pointed out the significant part that the business publications of the country have played in developing many phases of industry. The great national associations of the country, with which are affiliated practically every enterprise of any magnitude today, have been called into being and fostered by the enterprising trade and technical publications devoted to these industries. His suggestion for a more practical working out and understanding of these relations resulted in the appointment of a committee whose special function it will be to develop this idea.

W. H. Ukers, president of the *Tea and Coffee Trade Journal*, New York, and president of the New York Trade Press Association, delivered a classical address entitled "Standards of Practice for Business Papers," which were unanimously adopted by the convention as follows:

Standards of Practice for Business Papers.

The publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself:

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups;" to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Other papers which attracted considerable discussion were as follows:

"The Relations of the Farm and Business Press," by Hugh McVey, advertising counsellor of *Successful Farming*, Des Moines, Ia.

"Clean Up and Paint Up Campaigns," by Allen W. Clark, publisher of the *American Paint and Oil Dealer*, St. Louis, Mo.

"The Weak Spots in Trade Paper Efficiency," by Elton J. Buckley, editor of the *Modern Merchant and Grocery World*, Philadelphia, Pa.

"How Service Gets More Business," by J. Horace Lytle, advertising manager of *Better Roads and Streets*, Dayton, O.

"How Business Papers can get More Business From Advertising Agencies," by J. J. McPhillips, advertising editor of the *Textile World Record*, Boston, Mass.

"What the Newspaper Can Teach the Trade and Technical Journal," by E. J. Mehren, editor of *Engineering Record*, New York.

At the annual banquet on Wednesday evening, the principal speakers were Secretary of the Navy Josephus Daniels and the Honorable Job E. Hedges, of New York.

Officers were elected as follows:

A. A. Gray, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago, president.

W. H. Ukers, *Tea and Coffee Trade Journal*, New York, vice-president.

Charles-Allen Clark, *American Paint and Oil Dealer*, St. Louis Mo., secretary-treasurer.

Telephone Pioneers Journey to San Francisco.

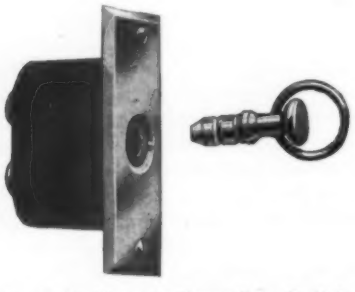
The Telephone Pioneers of America, an organization of men who have had at least 21 years' service in the telephone field, journeying to San Francisco over an extended route, left New York on Tuesday, September 14. Connections were made at Chicago from Boston, Pittsburgh and other points, the train leaving Chicago on September 15 and visiting Omaha, Denver, Colorado Springs and Salt Lake City. It is expected that the arrival at San Francisco will be made on the evening of September 20. The convention will be held from September 21 to September 23, inclusive. Among those participating in the tour, the total distance of which will be 7,746 miles, are the following: C. F. Annett, Jerome, Ida.; Geo. R. Armstrong, Denver, Colo.; J. T. Blake, Newark, N. J.; W. J. Berry, Detroit, Mich.; H. C. Baker, Hamilton, Ont.; A. F. Brooks, New Haven, Ct.; E. H. Bangs, Chicago, Ill.; O. H. Berthold, New York, N. Y.; F. J. Boynton, Boston, Mass.; E. Corrigan, Baltimore, Md.; A. S. Campbell, New York, N. Y.; C. T. Clagett, Washington, D. C.; J. J. Donnelly, Brooklyn, N. Y.; C. B. Doolittle, New Haven, Ct.; John E. Foster, Boston, Mass.; S. B. Goodloe, Brooklyn, N. Y.; W. C. Graham, Newark, N. J.; F. A. Garrett, Syracuse, N. Y.; F. W. Griffin, Philadelphia, Pa.; W. L. Hermance, Paterson, N. J.; P. J. Hartmann, New York, N. Y.; H. G. McCully, Orange, N. J.; R. T. McComas, Cincinnati, O.; J. H. Mehaffey, Wilmington, Del.; G. B. Pierce, Hyde Park, Mass.; J. W. Stearns, Jamestown, N. Y.; F. R. Starkey, Boston, Mass.; R. H. Starrett, New York, N. Y.; F. B. Uhrig, Kansas City, Mo.; J. G. Wray, Chicago, Ill.; Chas. H. Wilson, New York, N. Y.

New Electrical and Mechanical Appliances

New Cutler-Hammer Switch for Preventing Automobile Thefts.

Every motorist is always in more or less fear of having his automobile stolen. Even though the car may be recovered, there are sure to be costly repairs to be made at his expense. Many automobilists lock their cars by using the standard C-H push-and-pull lighting switch for the purpose of grounding the magneto, placing the switch in some out-of-the-way location known only to the owner or driver.

A new switch has now been designed for this purpose by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This switch, shown in the accompanying illustration and referred to as catalog No. 7171, provides against theft by means of a removable plug. Pulling out this plug grounds the magneto and prevents operation of the car. The switch may be installed in the same location as the lighting switches or in any other place on the car. The ring on the plug allows carrying on a key-ring when not inserted in the switch.



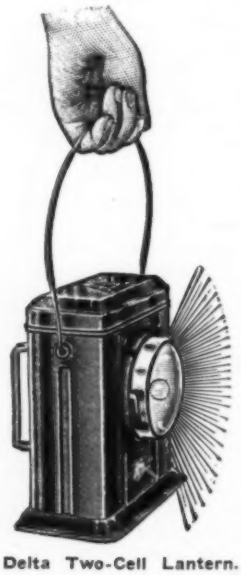
New C-H Magneto-Grounding Switch.

Delta Two-Cell Electric Lantern.

Following the very successful marketing of its now well known Delta electric hand lamp, equipped with a single No. 6 dry cell, the Delta Electric Company, Marion, Ind., has recently placed on the market the two-cell lantern illustrated herewith. This lantern takes two ordinary dry cells, either round or square, thus providing a more powerful light source and one giving longer hours of burning than is possible with a single cell.

The case is of cold-rolled sheet steel, provided with ribs to give additional strength. The case has a flanged base and is given a black enamel finish with nickeled trimmings, making a very neat outfit. Battery connectors are provided for ready connection of the cells, regardless of the type of cell termina. The switch is conveniently placed directly above the rear grip handle. A three-volt high-grade tungsten lamp is used. The silvered reflector and lens are arranged to give an even and wide distribution of the light without filament reflections.

While this lantern is particularly useful on the farm, in railroad service, and in places where the dangerous and unsatisfactory oil lanterns are now employed, it is of value whenever a powerful, safe and reliable portable lantern is needed.



Delta Two-Cell Lantern.

Flexible Metal Electric Heating Pad.

The use of electric heating pads is rapidly superseding the antiquated method of relying upon the troublesome hot-water bottle. Both the types of electric heating pads now on market, the flexible cloth pad and the stiff metal-inclosed pad, have their many advantages and some disadvantages. The cloth type is regarded by some as hazardous because of the possibilities of short-circuiting the wires. On the other hand, the metal-covered pad is reliable and satisfactory in every way except where in certain applications a flexible pad is desired.

In an effort to meet the desirable features of both these types there has recently been placed on the market a metal-clad flexible electric heating pad, which is said to be absolutely safe. It consists of 11 hinged or interlocked units which form a metal jacket or case over the wire-wound mica heating element inside; thus it readily conforms to the body curves and may easily be wrapped around a limb. This appliance is furnished with a washable eiderdown cover, which slips over the metal case and affords a soft soothing surface for application to the skin.

This new pad operates from any lamp socket. It consumes but 40 watts at high heat and is conveniently arranged with a small lever which permits graduated regulation of the heat so that the temperature may be maintained at several points between 100 and 200 degrees Fahrenheit. This lever is so arranged that it can be operated in the dark or underneath the bed covers without fear of getting the wrong degree of heat. The temperature is automatically maintained constant by a thermostat, which automatically cuts off the current and cuts it in again as the temperature fluctuates.

This appliance is known as the Hotpoint Safety Comfo, and is manufactured by the Hotpoint Electric Heating Company, Ontario, Cal.

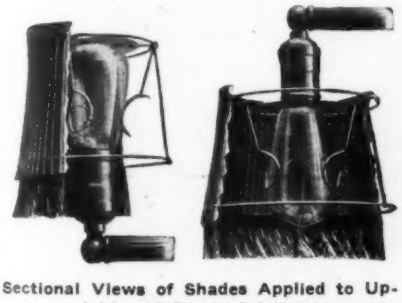
New Hotpoint Heat Pad.

Silk Illuminating Shades.

In view of the growing appreciation on the part of the consumer for softened and colored light, unusual

interest is attached to recent developments made in the manufacture of silk shades in various colors which meet the requirements of electric lighting. Shades to fulfill this purpose in a measure have been turned out by the millions; but there has been felt throughout the trade a need for shades that are not alone artistic but which are mechanically fit to cope with actual conditions, thus making for safety, durability and permanent stability. For it is not good business to install shades that will scorch or wear out quickly, or work out of place easily. The simple wire frame, attached in almost any way to the lamp or socket, balanced on the tip of the lamp bulb or loosely fitted into the ordinary shade-holder, was a most unsatisfactory thing. These objections have been done away with, apparently, by the Storrs Mica Company, Owego, N. Y., in its latest productions.

Typical Storrs Silk Shades on Portable Lamps.



Sectional Views of Shades Applied to Upright and Pendent Lamps.

These new shades fit all standard incandescent electric lamps, from the 10 to 60-watt sizes. Special holders are not required. The shade is slipped over the lamp bulb and three positive spring-wire grips, in contact at six points on the sides of the bulb, hold the shade firmly in place. The centering mica disk securely fastened in the top of the shade rests on top of the lamp bulb when the lamp is in an upright position.

With lamps in a pendent position this mica disk fits closely around the neck of the bulb, and as mica is a non-conductor of electricity, the claim is made that it is not possible for the wire frame on Storrs shades to become grounded or cause a short-circuit, as so frequently happens with poorly designed wire frames.

Storrs silk shades produce the proper diffusion of light by a special process treatment on their inner surface with a mica flour—minute particles of ground mica—mixed with a suitable binding fluid deposited on that part of the silk forming the inside of the shade. Another innovation is the circular silk disk of the same material as the shade, fastened in the top of these shades, for upright use, so as to cast a tinted light on wall or ceiling.

The shades are packed in separate cardboard cartons. The frames for electric lamps are furnished without silk coverings where it is desired to use a particular fabric to match other material or for any other reason desired. These shades, it would appear, should prove very serviceable in the home, hotel, or wherever artistic and effective lighting is desired.

New Single-Phase Induction Motors.

A new type of single-phase motors known as "Advance" type WS, has been placed on the market. These motors are of the repulsion induction type, starting as a repulsion motor and automatically short-circuiting at running speed, thus relieving the commutator of all work, except during the starting period. They are made in sizes one-eighth to five horsepower for all standard voltages and frequencies, and finished in baked black enamel in smaller sizes. They have large steel shafts with ring-oiling bronze bearings that are easily changed for wall or ceiling suspension. The sheet steel used in the laminations is of a superior grade and this, with the enameled-insulated windings and careful design, has produced an exceptionally compact and efficient motor. These motors are especially desirable for operation on lighting circuits, as the starting current is small, and they accelerate rapidly with strong torque, and will start on a fuse that gives the motor protection again overload.

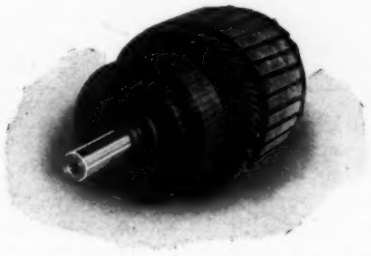


Fig. 1.—Advance Type WS Rotor Complete.

The vital feature of a motor of this type is the device that automatically changes the motor from a repulsion to straight induction machine. To give lasting satisfaction, this must be rugged, reliable and always act at the proper speed. Fig. 1 gives an end view of the commutator, showing the copper short-circuiting weights in the starting position, that is, pulled down out of contact with the commutator segments. The centrifugal force of the short-circuiting weights is opposed by a heavy spring, encircling the shaft and adjusted to allow the circle of weights to expand and make contact with the commutator segments when the motor reaches about 90 per cent of synchronous speed, making a positive copper-to-copper short-circuit of the individual armature coils. Fig. 2

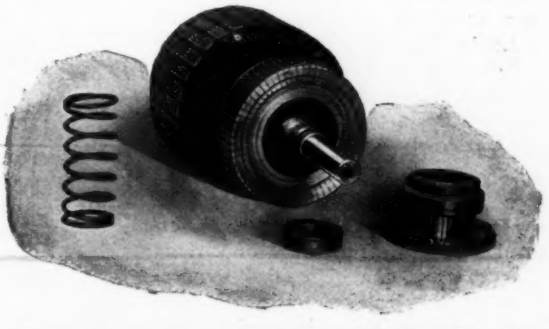


Fig. 2.—Rotor with Parts of Automatic Short-Circuiting Mechanism Detached to Show Simplicity of Construction.

shows the whole mechanism, the short-circuiting weights, spring and retaining nut removed, giving an idea of the simplicity of the device. As the contact elements are acted upon directly by the centrifugal force, all connecting rods, bell cranks, governor weights and numerous parts have been completely eliminated. The strong spring tending to hold the weights in the starting position, always exerts a strong pressure against the end of the commutator, insuring a rubbing contact, under heavy pressure, consequently the short-circuit is perfect, and there is no heat or burning of contacts. As each short-circuiting weight is acted upon directly and independently by centrifugal force, there are many points of contact with uniform pressure. All moving parts are of either brass or copper, so there is no chance of rust interfering with the action, even when subject to dampness or infrequent use. This device has now been in use for over three years with the most satisfactory results. It is also applied to automatic self-starting polyphase motors for elevator service, remote control or the like, when it is necessary to keep the starting current down, or secure higher starting torque than the squirrel-cage type gives.

These motors are identical in dimension with motors for direct and polyphase current, so that no change of patterns is necessary in direct connecting, to mount motors for the various current services, or in changing from one to another. They are manufactured by the Advance Electric Company, 22 North Commercial Avenue, St. Louis, Mo.

New Porcelain Receptacles.

To the extensive line of receptacles produced by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., there have been added recently four new porcelain cleat receptacles, illustrated herewith. These are of various types to meet the diversified requirements of the electrical trade. Each of the receptacles is provided with large binding-screws upset at the ends to save time in wiring. The entire husk is composed of one piece of heavy porcelain to minimize the liability of breakage. One of the receptacles has a bead for the attachment of shade or reflector-holder.

Group of New Porcelain Cleat Receptacles.

Small Electric Washer for Infants' Wear.

It has been said that the coming of a baby brings to its mother the climax of human joys. It is well known, however, that the infant also brings great responsibilities and arduous duties, among which is the frequent changing of the baby's napkins and the washing thereof. This makes almost every day a washday and is the most disagreeable of the mother's tasks.

Baby Geyser Electric Washer.

In the firm belief that electricity is the greatest foe to drudgery, one of the manufacturers of electric washers has developed and placed on the market a compact and very neat machine especially designed for this and similar service. This washer operates on the same geyser principle as this maker's larger "Capital Safety First" electric washer, that is, a motor-driven, two-blade propeller forces a strong stream of hot, soapy water through the clothes, which are churned about in the smooth cylindrical tank and thereby thoroughly cleaned without wear or tear.

The machine is but 14 inches wide and yet has ample capacity for a considerable batch of infant's diapers. It can also be used for taking care of all the washing of a small family. It can hold as much as seven shirts or three sheets in one washerful. A small hand wringer can be easily clamped on the back. This washer is of simple, but substantial construction, and has no gears or other machinery or sharp points on which the clothes might be torn. It is of compact design so as to permit its use in even small bathrooms. No water need be lifted in this case. The hot water can be supplied through a hose and the waste discharged directly into the closet bowl, as shown in the cut herewith.

This new washer is known as the "Baby Geyser Electric Washer," and is manufactured by the Capital Electric Company, 321 North Sheldon Street, Chicago, Ill.

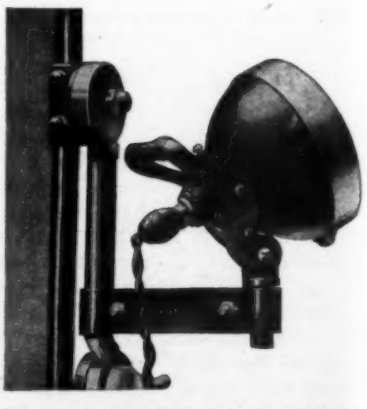
Searchlight With Focusing Adjustment for Any Style of Lamp.

A new automobile searchlight, known as the Pittsburgh Five, is provided with an outside set-crew focusing adjustment, which permits the use of any style lamp, either vacuum or gas-filled, regardless of size or voltage, and makes it possible to adjust the lamp instantly for any kind of beam without disturbing it in any way or removing it from its position.

Due to this accessible adjustment, the lamp may be transferred from one car to another of different voltage at will. It also enables the user to select a bulb to suit his requirements, and in case of accident to use any available bulb as a renewal. Should it become necessary to use the searchlight to take the place of the headlight, the width of the illuminated field can be increased as desired.

Another feature of the device is the double-curvature parabolic reflector, which, though only five inches in diameter, is said to produce as much beam candlepower as any large automobile headlight, with even distribution of light. It is claimed the most powerful searchlight manufactured. A minor feature, but one of considerable convenience, is the design of the handle, which serves as a stand for holding the lamp in an upright position when detached for repairing tires, etc.

This lamp is manufactured by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.



Pittsburgh "Five" Electric Searchlight.

Current Electrical News

ATLANTIC STATES.

NUNDA, N. Y.—Nunda Electric Light Company, Incorporated; light, heat, etc. Capital, $10,000. Incorporators: Harry J. Gordon, Mary L. Gordon and Leon A. Willard, Nunda, N. Y.

ELIZABETH, N. J.—Articles of incorporation have been filed for the Commonwealth Electric Company, 19 Beechwood Road, Summit. The company is capitalized at $500,000, and the incorporators are Carroll P. Bassett, Fred R. Drake, Frank C. Kimball, Stephen W. Borden and H. Marsh Shorrock.

GREER, S. C.—Bonds to the amount of $10,000 have been voted for extending the street electric lighting system. Address mayor.

COLUMBUS, GA.—The Columbus Power Company will increase the capacity of its transformer equipment at the Goat Rock plant, increasing the use of electrical energy in West Point, LaGrange, Newnan and other industrial cities in western Georgia as made this necessary.

NORTH CENTRAL STATES.

TROY, O.—W. E. Hunter, of New York, and John B. Hurst and A. B. Cornett, of Troy, are discussing a plan for the sale by the latter, as owners of the dye mill property, of the water and other rights in connection with it for use for industrial purposes. New York interests, it is understood, will construct a factory building, using the water power for the generation of current for all purposes, to the extent of 1,000 horsepower. L.

WASHINGTON, O.—The Washington Gas and Electric Company has entered into a contract, approved by the City Council, for the installation of a complete new street-lighting system, under plans and specifications prepared by H. Whitford Jones, and settling rates and other details for a term of 10 years. The contract provides for the installation of 406 nitrogen lamps of 100 candlepower, 212 lamps of 250 candlepower for ornamental standards in the business district, and 52 lamps of 250 candlepower for other purposes. The installation is to be completed within six months. L.

KANKAKEE, ILL.—The County Board plans to install an electric lighting system for courthouse and jail. Address Supervisor Frank Hennessey, of the lighting committee.

ASHLAND, WIS.—A $75,000 electrical plant will be constructed by the Ashland Light, Power and Street Railway Company.

LAKEFIELD, MINN.—Plans are under consideration for a new white way. Address city clerk.

BREDA, IOWA.—Bonds have been voted for electric lights. Address town clerk.

STEELVILLE, MO.—The Steelville Electric Light and Power Company has been incorporated with a capital of $10,000, by John Zahorsky, Jr., and others.

HOYT, KANS.—A municipal electric lighting plant may be installed here. Address town clerk.

BARNSTON, NEBR.—A hydroelectric power plant will be installed to supply electricity to towns along Blue River. Address George H. Steinmeyer, mayor.

BLAIR, NEBR.—The citizens have voted to issue $35,000 in bonds to purchase the electric light plant or build a new one. Address city clerk.

LAUREL, NEB. — Bonds to the amount of $12,000 have been voted for the building of a municipal electric lighting plant. It is intended to start the work as soon as the bonds are sold.

SOUTH CENTRAL STATES.

CLAY, KY.—The Perry Light and Ice Company is constructing a three-mile high-tension transmission line. It is planning the purchase of a second-hand, belted, 60-cycle, 2,200-volt, single-phase, 50 to 75 kilowatt alternator, with exciter.

FT. THOMAS, KY.—The Union Light, Heat and Power Company, of Covington and Newport, Ky., has been awarded franchises for electric, gas and water purposes in Fort Thomas, in accordance with bids submitted by the company some time since, and will accordingly extend its service facilities in the town considerably. L.

JUNCTION CITY, KY.—An electric light, power and traction franchise has been ordered sold by the Board of Trustees of this city.

PROVIDENCE, KY.—An election will be held November 7 to vote on issuing $20,000 in bonds to build an electric light plant. Address R. L. Price, clerk.

FAIRHOPE, ALA.—The citizens voted in favor of establishment of municipal electric light plant. Address mayor.

JOURDANTON, TEX.—The Atascosa Ice, Water and Light Company will extend its lighting system to the residence portion of town. D.

WESTERN STATES.

ALBION, IDAHO.—Bonds amounting to $8,000 have been voted, to be used in contracting for power for a lighting and power system. Address city clerk.

KENDRICK, IDAHO.—The City Council has granted A. V. Dunkle, of Plummer, Idaho, a franchise to construct an electric light plant, same to be in operation in 60 days. The estimated cost is $10,000.

RENTON, WASH.—Hugo Thornblade, president of the Pacific Electric Welding & Manufacturing Company, Arcade Building, Seattle, states his company will immediately install machinery for the manufacture of electric welding machines, ornamental iron, etc., in a building which was recently purchased in this city. The company will invest several thousand dollars in the proposition. O.

REPUBLIC, WASH.—A transmission line from Republic to Danville will be constructed in the immediate future by F. R. Clark, who has a franchise to carry out this improvement. The line to be built will derive its current from the West Kootenai Company's power line, from Bonnington Falls, near Danville. It is understood practically all of the electrical energy will be disposed of at the local mines and stamp mills, which, heretofore, have been operated with steam power. S. H. Richardson, of Republic, has begun making surveys for the proposed improvement. O.

EUGENE, ORE.—Definite plans for the construction of a 1,250-kilowatt auxiliary steam plant, to be built by the Eugene Water Board, as an auxiliary to the city's municipal hydroelectric plant, near Waterville, on the McKenzie River, have been announced by the Water Board. The proposed plant will cost between $50,000 and $60,000, and will consist of a boiler and engine, and a set of generators, with sufficient capacity to furnish light and power for the city in case the hydroelectric plant is temporarily out of commission. The Water Board is now taking bids on two sets of specifications, one for the installation of the ordinary type and the other for the installation of a Diesel engine. Closing date of bids has not been announced, although it is understood bids will be opened early in October. O.

PROPOSAL.

LIGHTING FIXTURES.—Sealed bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until October 13, 1915, for electric fixtures for the United States post office at Naugatuck, Conn. Drawings and specifications may be obtained from the custodian of the site at Naugatuck, Conn., or at the office of the supervising architect, Washington, D. C.

NEW INCORPORATIONS.

SPILLVILLE, IOWA.—The Spillville Electric Light Company has been incorporated with a capital of $10,000.

CALMAR, IOWA.—The Calmar Electric Company has been incorporated with a capital of $15,000. Andrew Latimer is president.

STEELVILLE, MO.—Steelville Electric Light and Power Company; capital $10,000. Incorporators: John Zahorsky, Jr., A. H. Harrison and W. E. Evans.

SEATTLE, WASH.—The Vashon Light and Power Company has been organized with a capital of $100,000, by John E. Burkheimer and A. S. E. Robertson.

MILWAUKEE, WIS.—The Roberson Electrical Appliance Company has been organized with a capital of $10,000, by L. C. Roberson, P. A. Klumb and D. C. Madden.

BRONX, N. Y.—Sayles Electric Company, Incorporated. Capital, $1,000. Incorporators: Caspar C. Sayles, Hilda Vielberth and Rudolph Loewenthal, Bronx, N. Y.

NEW YORK, N. Y.—The Bass Company, Incorporated; electrical fixtures. Capital, $20,000. Incorporators: Fabia

Wittman, John Kerekes and William Bass, New York.

BRONXVILLE, N. Y.—H. Ward Leonard, Incorporated; electrical work. Capital, $10,000. Incorporators: Leonard Kebler, James W. Good and Allan R. Campbell, Bronxville, N. Y.

WILMINGTON, N. C.—The National Electric Thermometer Company has been incorporated with a capital stock of $10,000. The incorporators are B. W. Jordan, T. B. Jordan and T. W. Davis.

NEW YORK, N. Y.—Joseph P. Day Private Sales Department, Incorporated; electrical sales agency. The incorporators are Joseph P. Day, John S. Turnbull and Roy C. Middlebrook, all of New York City.

GLIDDEN, IOWA.—A company has been organized under the name of the North Glidden Electric Company, to supply electricity for lamps and motors to the farmers in vicinity. Capital is $5,000. A new plant may be built. J. G. Merritt, president.

FINANCIAL NOTES.

The Westinghouse Electric & Manufacturing Company announced that the offer to stockholders to subscribe to the new convertible bonds of the company had resulted in their purchase of all but $457,000 of the issue. Bonds not subscribed for are to be distributed pro rata among the depositing bondholders, who will receive cash for the balance of their deposited bonds at the rate of 105 and accrued interest.

Net earnings from operations of the Edison Company, of Boston, for fiscal year ended June 30 last, crossed the $4,000,000 mark, for the first time in the history of the company, the exact figure being $4,002,292, compared with $3,855,016 in the previous year, an increase of $147,276, or three per cent.

Kansas City Railway & Light Company stockholders have accepted the plan formulated by Federal Judge Hook for the reorganization of Metropolitan Street Railway of Kansas City and Kansas City Electric Light Company. A supplemental plan for the Kansas City Railway & Light will be issued shortly and it will not provide for any assessment on Kansas City Railway & Light Company stocks.

Dividends.

	Term	Rate	Payable
Am. Gas & Elec. com..	Q	2 %	Oct. 1
Am. Gas & Elec. pf....	Q	1.5 %	Nov. 1
Am. Tel. & Tel.....	Q	2 %	Oct. 15
Ark. Ry., Lt. & Pr. pf.	Q	1.75%	Sept. 15
Bell Telephone, Canada	Q	2 %	Oct. 15
Brazilian Trc., Lt. & Pr. pf.	Q	1.5%	Oct. 1
Brockton & Plymouth St. Ry. pf.	S	$3.00	Sept. 15
Cal. Ry. & Pr. prior pf.	Q	1.75%	Oct. 1
Cent. States Elec. Corp. pf.	Q	1.75%	Oct. 1
Duluth-Superior Trac. pf.	Q	1 %	Oct. 1
Eastern Pr. & Lt. pf....	Q	1.5%	Sept. 15
El Paso Elec. Com.....	Q	$2.25	Sept. 15
Galveston - Houston Elect. pf.	S	$3.00	Sept. 15
Ill. Trac. pf.	Q	1.5 %	Oct. 1
Indiana Ltg.	S	1 %	Oct. 1
Manhattan Ry.	Q	1.75%	Oct. 1
Manila Elec. R. R. & Lt.	Q	1.5 %	Oct. 1
Muskogee Gas & Elec. pf.	Q	1.75%	Sept. 15
Phila. Trac.	S	$2.00	Oct. 1
So. Utilities pf.	Q	1.75%	Oct. 1
Standard Gas & Elec. pf. (payable in scrip)	Q	1 %	Sept. 15
Twin City Rap. Tran. pf.	Q	1.75%	Oct. 1
Twin City Rap. Tran. com.	Q	1.5 %	Oct. 1
Western Union	Q	1.25%	Oct. 15

Reports of Earnings.

WESTCHESTER STREET RAILROAD.

Westchester Street Railroad Company reports to the up-state Public Service Commission, for the quarter ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$66,507	$64,464
Net earnings	36,490	11,559
Surplus after charges	22,477	*1,713

*Deficit.

YONKERS RAILROAD.

Yonkers Railroad Company reports to the up-state Public Service Commission, for the quarter ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$190,239	$187,834
Net earnings	46,783	14,295
Surplus after charges	5,610	*26,058

*Deficit.

WESTCHESTER ELECTRIC RAILROAD.

Westchester Electric Railroad Company reports to the upstate Public Service Commission, for the quarter ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$157,898	$146,332
Net earnings	27,136	41,119
Deficit after charges	10,269	*4,979

*Surplus.

HAVANA ELECTRIC RAILWAY, LIGHT & POWER.

	1915	1914
Seven months' gross	$3,199,879	$3,120,189
Seven months' net income to July 31	1,188,225	922,908

WISCONSIN EDISON.

	1915	Change From 1914
July gross	$ 675,707	Dec. 6.42%
Operating expenses.	428,303	Dec. 3.12%
Net earnings	248,404	Dec. 11.59%
Balance available for holding company and depreciation..	111,118	Dec. 22.72%
Twelve months' gross	8,457,580	Dec. 3.50%
Operating expenses..	5,026,037	Dec. 3.16%
Net earnings	3,431,544	Dec. 3.98%
Balance available for depreciation and for holding company	1,796,517	Dec. 10.21%

Depreciation reserve for twelve months ended July 31, 1915, was $882,754, an increase of 6.01 per cent over the preceding year.

INTERBOROUGH RAPID TRANSIT COMPANY.

Interborough Rapid Transit Company reports for the year ended June 30, 1915, compares as follows:

	1915	1914
Gross operating revenue	$33,433,743	$33,515,396
Operating expense	12,941,314	12,902,053
Net operating revenue	20,492,429	20,613,342
Taxes	2,133,980	2,081,948
Operating income	18,358,449	18,531,394
Other income	623,631	612,852
Total income	18,982,080	19,144,246
†Interest	10,913,595	11,119,666
Net corporation income	*8,068,484	8,024,580
Dividends	7,000,000	5,250,000
Surplus	1,068,484	2,774,580
Passengers carried	647,378,266	651,886,671

*Equal to 23.05 per cent on $35,000,000 capital stock, as compared with 22.92 per cent earned previous year.

†Rent, etc., including Manhattan Railway guarantee.

CALIFORNIA TELEPHONE & LIGHT.

California Telephone & Light Company reports earnings for seven months ended July 31, as follows:

	1915	1914
Gross earnings	$124,395	$112,470
Net after taxes	55,116	46,150
Surplus after charges	31,127	23,943
Balance after depreciation	26,841	20,667
Balance after preferred dividends	6,682	1,802

AMERICAN PUBLIC UTILITIES.

American Public Utilities Co. reports income account for the fiscal year ended June 30 as follows:

	1915	1914
Gross earnings	$2,932,070	$2,319,595
Net after taxes	1,313,831	980,879
Other income	25,930	45,303
Total income	1,339,761	1,026,182
Expenses	38,101	51,486
Balance	1,301,659	974,656
Fixed charges	952,109	599,309
Preferred dividends	234,840	234,840
Balance	114,711	140,547

DETROIT UNITED LINES.

	1915	1914
July gross	$1,205,881	$1,129,955
Net	340,577	333,553
Surplus after charges..	172,402	170,600
Seven months gross	7,282,569	7,044,772
Net	2,140,008	2,048,159
Surplus after charges..	989,789	956,177

LEHIGH VALLEY TRANSIT.

	1915	1914
July gross	$ 190,563	$ 175,676
Net after taxes and depreciation	83,665	72,816
Other income	11,148	9,977
Total income	94,803	82,704
Surplus after charges..	39,707	20,833
Twelve months gross..	1,939,185	1,866,565
Net after taxes and depreciation	777,386	713,014
Other income	129,626	126,199
Total income	907,013	839,214
Surplus after charges..	247,194	207,488

LAKE SHORE ELECTRIC RAILWAY.

	1915	1914
July gross	$ 136,447	$ 151,999
Net after taxes	57,665	72,778
Surplus after charges..	21,445	37,010
Seven months gross	761,570	810,105
Net after taxes	248,170	299,238
Deficit after charges	4,327	*51,749

*Surplus.

CLEVELAND, PAINESVILLE & EASTERN RAILROAD.

	1915	1914
July gross	$ 44,653	$ 45,282
Net after taxes	22,873	23,338
Surplus after charges..	11,762	12,243
Seven months gross	224,392	232,351
Net after taxes	96,202	108,596
Surplus after charges..	19,391	31,568

MT. WHITNEY POWER & ELECTRIC.

	1915	1914
July gross	$ 64,342	$ 63,305
Net after taxes	39,285	34,857
Surplus after charges..	25,795	22,472
Twelve months gross..	751,603	667,769
Net after taxes	444,138	331,348
Surplus after charges..	291,812	190,674

GREAT WESTERN POWER.

	1915	1914
July gross	$ 224,137	$ 216,936
Net after taxes	170,648	148,346
Total income	187,932	167,015
Surplus after charges..	81,740	66,042
Balance after preferred dividends	69,240	53,542

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 6	Sept. 13
American Tel. & Tel. (New York)	122¼	122¾
Commonwealth Edison (Chicago)	137	136
Edison Electric Illuminating (Boston)	232	237
Electric Storage Battery common (Philadelphia)	75⅝	72½
Electric Storage Battery preferred (Philadelphia)	75⅝	72½
General Electric (New York)	171	170½
Kings County Electric (New York)	119	120
Massachusetts Electric common (Boston)	7	8
Massachusetts Electric preferred (Boston)	39¼	43
National Carbon common (Chicago)	140	140½
National Carbon preferred (Chicago)	119¼	120
New England Telephone (Boston)	129½	129½
Philadelphia Electric (Philadelphia)	24½	25
Postal Telegraph and Cables common (New York)	75¼	76
Postal Telegraph and Cables preferred (New York)	66¾	66½
Western Union (New York)	74	75¾
Westinghouse common (New York)	115¼	114
Westinghouse preferred (New York)	135	134

DETROIT EDISON COMPANY.

	1915	1914
July gross	$ 546,600	$ 465,119
Net after taxes	171,072	127,364
Surplus after charges	74,420	53,359
Seven months' gross	4,277,332	3,620,936
Net after taxes	1,578,494	1,239,737
Surplus after charges	974,456	756,104

PACIFIC LIGHT & POWER CORPORATION.

	1915	1914
July gross	$ 259,322	$ 222,191
Net after taxes	178,409	123,831
Other income	9,382	14,966
Total income	187,791	138,797
Surplus after charges	80,329	30,555
Seven months' gross	1,643,025	1,497,005
Net after taxes	1,092,533	862,049
Other income	74,195	104,713
Total income	1,166,727	966,763
Surplus after charges	412,831	252,752

DAYTON POWER & LIGHT COMPANY.

	1915	1914
July gross	$ 76,032	$ 68,456
Net	35,288	27,744
Surplus after charges	17,166	10,528
Twelve months' gross	1,003,033	885,369
Net	465,869	390,628
Surplus after charges	252,024	186,222

SOUTHERN CALIFORNIA EDISON.

	1915	1914
July gross	$ 417,590	$ 407,572
Net after taxes	253,065	250,083
Surplus after charges	165,747	173,416
Balance after depreciation	75,747	83,416
Seven months' gross	2,734,120	2,718,077
Net after taxes	1,536,283	1,396,013
Surplus after charges	952,430	866,226
Balance after depreciation	622,430	536,226

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
July gross	$ 371,736	$ 351,659
Net after taxes	152,033	145,489
Surplus after charges	100,228	94,641
Balance after preferred dividends	83,861	79,536
Seven months' gross	2,128,388	2,073,359
Net after taxes	807,038	807,554
Surplus after charges	446,768	454,871
Balance after preferred dividends	332,465	349,649

PERSONAL MENTION.

MR. THEODORE CLAUSS, for some years secretary of the Union Gas and Electric Company, until succeeded a year or two ago by T. F. Wickham, has resigned his connection with the company, effective October 1, in order to devote all of his time to his duties as secretary of the Cincinnati Gas and Electric Company, whose gas and electric facilities are leased by the Union Gas and Electric Company.

MR. ROBERT MONTGOMERY, commercial manager of the Louisville (Ky.) Gas & Electric Company, is representing the company in the organization of a Safety First League in that city, to be affiliated with the National Safety First League. Street and steam railway, automobile, educational and civic interests have taken hold of the project, which was set on foot by Coroner Ellis Duncan, and the league will formally be organized in the near future.

MR. CHARLES A. RUSSELL, of Gloucester, Mass., has been appointed by Governor Walsh as a member of the Public Service Commission of Massachusetts, to succeed Mr. Clinton White, who retired from the board at the prescribed age limit. Mr. Russell is a lawyer and a Democrat. He is a native of Canton, Mass., graduated from Colby College, Maine, and from the Boston University Law School. He was admitted to the bar in 1880. He was city solicitor of Gloucester for eight years and was its counsel in the litigation between the water company and the city over the taking of works. The new commissioner is an Odd Fellow, Red Man, a member of the University Club of Boston, and of the Salem Club of Salem.

MR. HERBERT ELDER has severed his connection as an electrical inspector of Underwriters' Association of the Middle Department, with which he was connected for about eight years, and he has also resigned his position of engineer of the Underwriters' Laboratories, Incorporated, in charge of its office at Baltimore, Md., for the past four years. He has now associated himself with G. O. Paxson, of Fredrick, Md., who has been carrying on an electrical construction, supply and fixture business. The new firm of G. O. Paxson Company will do a larger and more extensive contracting and fixture business in Fredrick and vicinity, and will be open to take up any branch of electrical contracting that presents itself.

MR. WILLIAM J. DOHERTY, for the past four years general supply sales manager of the Northern Electric Company, Limited, of Montreal, Canada, has returned to the United States and will make his headquarters in Chicago, representing the lines of a number of leading manufacturers of electrical material. "Bill" Doherty started in the electrical business with the Central Electric Company, Chicago, in May, 1899. He left the Central to enter the employ of the Western Electric Company in November, 1902, working in the stores department, purchasing department and sales department, holding the position of supply sales manager for several years before being transferred in 1911 to the affiliated company in Canada. As general supply sales manager he was in charge of sales throughout the entire Dominion of Canada until he resigned on August 1. Mr. Doherty has been a familiar figure in the electrical industry for a long time. A regular attendant at the conventions of the Electrical Supply Jobbers' Association, he has taken an active and conspicuous part in all of their proceedings. He is a Jovian, entering the Order in Richmond, Va., in 1910, and has served as a statesman, statesman-at-large and is at present a member of the Thirteenth Congress, holding the office of Reigning Chiron. Before leaving Montreal, the Canadian jobbers made him a present of a beautiful silver loving cup, mounted upon an ebony base and equipped with three stag-horn, silver-tipped handles. His associates in the Northern tendered him a banquet and presented him with a solid gold Waltham watch as a token of esteem. "Bill" has had a lot of experience, has a lot of good friends and ought to be a strong man for handling a strong line of electrical material.

William J. Doherty

MR. H. M. ROBERTS, until recently railroad representative of the General Lead Battery Company, has been appointed sales engineer of the railroad department of the Edison Storage Battery Company, Orange, N. J. Mr. Roberts graduated with the class of 1905 from the Sheffield Scientific School of Yale University, with the degree of Electrical Engineer, and for six years was connected with the engineering department of the New York Telephone Company in power plant work. After leaving the New York Telephone Company, he spent several years in general contracting-engineering on railroad and other large enterprises with James Stewart and Company, Incorporated, of New York. Mr. Roberts' headquarters will be at the factory and main office of the Edison Storage Battery Company at Orange, N. J.

MR. H. S. COOPER, well known in the Southwest as the secretary of the Southwestern Electrical and Gas Association for many years, has made arrangements whereby, while retaining his official connection with the Association, he is free to engage in consulting and advisory work in the construction, operation and management of electric light and power plants, street and interurban railways, gas works and water works. Mr. Cooper has had a very extended experience with the varied problems that come up in utility management, and his services as consulting or advisory engineer in clearing up problems in relation to utilities should prove highly valuable. Mr. Cooper's office is located at Rooms 405 and 406, Slaughter Building, Dallas, Texas.

OBITUARY.

MR. CHARLES TURBETT, seventy-two years old, who was an engineer in the Newark City Hall for many years, until his retirement two years ago, died Friday, September 10, of heart disease in his home, in the Ironbound district of Newark. He was a native of Ireland, but had lived in Newark nearly seventy years. During the civil war he served in the army and navy. He leaves a wife, one son and one daughter.

MR. ORIN H. NORTON, formerly city electrician of Peoria, Ill., and later one of its pioneer electrical contractors and dealers, died at his home in Peoria on September 5, aged 75 years. Mr. Norton was born in Opelonsas, La., and since he came to Peoria in 1841 has been almost continually a resident of that city. He was the organizer of a volunteer fire company and after a regular fire department was established he served several years as its first chief; for over twenty years Mr. Norton was an active fireman. In 1886 he was appointed city electrician. Later in company with Edgar Wetherell, he formed the electrical firm of Wetherell & Norton. When his partner retired from the business Mr. Norton organized the Central Electric Company of Peoria. He remained president of that firm until total blindness compelled his retirement in February, 1912. Mr. Norton was buried on September 7, with the full rites of the Odd Fellows Order, of which he had been a member for a great many years. He is survived only by his widow.

DR. KARL E. GUTHE, dean of the University of Michigan and a physicist of international prominence, died at a hospital at Ashland, Ore., Saturday, September 11, from shock following a capital operation. Dr. Karl E. Guthe was born in Hanover, Germany, March 6, 1866. He was educated at the Gymnasium, in Hanover, the Hanover Technical school and the universities of Marburg, Strasburg and Berlin. Coming to the United States in 1892, he became instructor of physics in the University of Michigan, and was assistant professor in that institution from 1900 to 1903. He was a member of the Bureau of Awards of the St. Louis Exposition in 1904. Doctor Guthe was a member of the American Physicists' Society, the Deutsche Physikalische Gesellschaft, Société Française de Physique, Washington Academy of Sciences and the Iowa Academy of Sciences. He wrote extensively on scientific subjects and was author with J. O. Reed of a manual of physical measurements, laboratory exercises with primary and storage cells and a text book on physics. He was an authority on electricity and wrote many brochures on that subject. He was married to Miss Clare Belle Ware, of Grand Rapids, Mich., in 1892.

DATES AHEAD.

International Engineering Congress, Civic Auditorium, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention, San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

New England Electrical Contractors' Association. Annual convention, Springfield, Mass., September 22 and 23. Secretary, H. D. Temple, Worcester, Mass.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electric Railway Association. Annual convention. San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

New York Electrical Show. Ninth annual exposition, Grand Central Palace, New York City, October 6-16. Geo. F. Parker, vice-president, 124 West Forty Second, New York City.

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention. Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention. Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The American Steel and Wire Company, Chicago, Ill., has been awarded the grand prize by the Panama-Pacific International Expositon for superiority of its products, and the high character of its exhibit.

The MacGillis & Gibbs Company, Milwaukee, Wis., is sending to purchasers of white cedar poles folders calling attention to its excellent facilities for shipping just as ordered cedar poles and other cedar products.

Horton Manufacturing Company, Fort Wayne, Ind., is sending out to dealers folders calling attention to its co-operatives sales plan for stimulating sales of its electric washer No. 32 with three-way wringer. This machine is backed up by 34 years of experience in the washing-machine business.

The Reliance Automatic Lighting Company, Racine, Wis., recently shipped 25 Reliance time switches to Australia. This order was received through an export merchant, and was in competition with various other makes of time switches. The Reliance Company has recently added to its line a 10-ampere switch.

Hubbard & Company, Pittsburgh, Pa., have published a large illustrated folder calling attention to the construction and obvious merits of the new Peirce Presteel brackets for use in overhead distribution-line construction. This should prove of much interest to central-station, as well as telephone men.

Ideal Lamp Manufacturing Company, Faribault, Minn., has issued a new catalog of its artistic electric portable table and floor lamps, domes, pedestals and other wood novelties. The line of this company's products, which are all made of seasoned wood, has been extended and many neat designs have been added.

Mathias Klein & Sons, Chicago, Ill., has issued catalog No. 16, which is a new complete list of the great variety of Klein electricians', linemen's and mechanics' tools. The new catalog covers 72 pages with several hundred illustrations of the various tools for which this company is well known. Included among these are several new tools of great utility and convenience.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued bulletin No. 1096, describing and illustrating its types K and KC direct-current motors and generators and their applicability to a variety of purposes. Bulletin No. 1635 is devoted to an illustrated description of the hydro-electric plant of the Cerro de Pasco Mining Company, of Peru, South America. This unique plant was completely equipped with Allis-Chalmers machinery.

The Hartford Time Switch Company, through its general sales agent, **A. Hall Berry,** 97 Warren Street, New York City, is sending out a new catalog of the Hartford time switch which describes and illustrates the several types of this well known automatic switch and sets forth its utility for a variety of purposes. This is in line with a nation-wide campaign in co-operation with jobbers all over the country to stimulate the use of these time-controlled switches.

Roller-Smith Company, 203 Broadway, New York City, announces that it has added to its list of agents the Conant Electric Company, Equitable Building, Baltimore, Md. The Conant Electric Company will handle Roller-Smith instruments and circuit-breakers and Columbia meters in the territory comprising the states of Maryland, Virginia, North Carolina, part of West Virginia and the District of Columbia. Associated with S. M. Conant is C. L. Ball, both of whom are well known in that territory.

The Mechanical Refrigerator Company, 1020 Willow Street, Chicago, Ill., has opened a downtown office and display room in the Fisher Building, specially devoted to the demonstration and sale of the company's automatic domestic electric refrigerator. This useful appliance, known as the Domelre, is the invention of Fred W. Wolf, one of the best known inventors and manufacturers of large refrigerating machines, who in recent years has devoted himself to the development of this successful electric household utility.

Westinghouse Lamp Company, 1261 Broadway, New York City, has ready for distribution No. 4 of its series of lamp handbooks for electrical salesmen. This particular copy is unique in giving in simple non-technical language the history, development, manufacture, characteristics and application of the Mazda C, or gas-filled, tungsten lamp. Numerous illustrations serve to further elucidate the subject. As in the case of the earlier handbooks of this series, a copy of No. 4 can be obtained by

anyone by merely writing to the company.

Pass & Seymour, Incorporated, Solvay, N. Y., has ready for distribution its new catalog No. 23 of handy electrical wiring devices. This presents the complete array of P. & S. sockets, receptacles, rosettes, pull and pendant switches, etc. A double-page illustrated table gives an excellent idea of the large variety of combinations that can be made with the Fluto interchangeable socket parts. The Shurlok locking socket is specially featured. On three pages are shown in colors the 25 special finishes in which P. & S. sockets and receptacles can be obtained. Among other things worthy of special mention are the P. & S. socket conveniences, outlet receptacles, mogul sockets and receptacles, interchangeable porcelain sockets and receptacles, etc.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently issued leaflets 3805, 3806 and 3807 on the application of automatic control apparatus to cranes and steel mills; they show the scheme of main connections and describe the method of operation of the magnetic unit switches, as arranged for the severe service of steel-mill practice. Among other recent publications of the company are: leaflet 2363-C on Westinghouse small direct-current motors of the type CD, leaflet 3506-A on paper-mill motors for pulp-mill service, leaflet 3568 on condenser-type bushings for high-voltage apparatus, leaflet 3826 on motors for use in oil-well fields, leaflet 3842 on battery-charging outfits of the mercury-arc type for vehicle batteries, leaflet 3846 on outdoor switch houses for use with outdoor substations, and reprint No. 24, entitled "The Jitney and the Small Car," an article by H. S. Cooper, secretary of the Southwestern Electrical and Gas Association.

The Hamilton-Beach Manufacturing Company, Racine, Wis., is now building a new factory adjacent to the Chicago & Northwestern Railway tracks. There will be three buildings, the main building being 300 feet long, 50 feet wide, and three stories high. The offices and main factory will be located in this building. The new factory will have an available floor space aggregating 52,000 square feet, an increase of 300 per cent over the present capacity. The factory as planned, it is claimed, will be one of the most modern in this part of the country. No expense will be spared in its construction and equipment, and the most modern and efficient machinery will be installed. A power plant consisting of a 175-kilowatt direct connected unit will be installed in one of the buildings, while the polishing and plating plant will be in another building. The company has bought eight acres of land in addition to the land occupied by the three buildings now in course of construction, and is, therefore, amply provided for future growth. The business of the Hamilton-Beach Company has shown wonderful growth in the last two years.

Record of Electrical Patents

Issued by the United States Patent Office, September 7, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,152,396. Means for Supporting and Controlling Gyratory Structures. G. W. Combs, Leavenworth, Kans. Has self-contained motor.

1,152,409. Soldering Machine. C. W. Graham, assignor to American Can Co., New York, N. Y. Has a magnetized plate for holding the cans.

1,152,433. Time Switch. T. J. Murphy, Rochester, N. Y. Particular arrangement of contacts and operating mechanism having detent, permitting contacts to be temporarily retained closed.

1,152,434. Gearing. C. H. Norton, assignor to Norton Grinding Co., Worcester, Mass. Arrangement of motor and gearing in grinding machine.

1,152,442. Separation of Coal. F. W. C. Schniewind, Englewood, N. J. Coal separated from mixture with other materials having different hygroscopic properties by moistening and separating electrostatically.

1,152,444. Detector. A. K. Sloan, Jr., Brooklyn, N. Y. Special contact-adjusting arrangement.

1,152,448. Railway Signaling. T. S. Stevens, assignor to Union Switch & Signal Co., Swissvale, Pa. Special arrangement of transformers, relays, etc., for lighting lamps for visualizing signals at night in alternating block system.

1,152,449. Air Can-Testing Machine. E. V. Swangren and M. E. Widell, assignors to American Can Co. Any leakage causing decrease of pressure in air charged into can moves diaphragm to close indicator circuit.

1,152,481. Controlling Device for Hydraulic Elevators. J. E. Boyce, assignor to Otis Elevator Co., Jersey City, N. J. Electromagnetic control of motor operating change-over valve in push-button started plunger elevator.

1,152,501. Brake-Magnet-Demagnetizing Device. E. L. Gale, Sr., assignor to Otis Elevator Co. De-energizing current is supplied to brake magnet of elevator to reduce residual magnetism and aid release of shoe.

1,152,504. Power-Transmission Mechanism. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Electromagnetically controlled gear-shifting mechanism for automobile.

1,152,505. Electrical Furnace. W. H. Hampton, assignor to Conley Electric Furnace Co., Wilmington, Del. Zinc-reduction furnace has baffle blocks in shaft with electrical resistance material in the blocks for heating charge as it passes over.

1,152,516. Electric Change-Over Switch. T. Jessen, assignor to Blohm & Voss Kommandit-Gesellschaft auf Aktien, Hamburg, Germany. For selectively connecting a feeder line to any one of several independent supply lines.

1,152,522. Validating Stamping System. J. J. Leidigh, assignor to National Cash Register Co., Dayton, O. Die mounted in table has perforations to receive pin projections of electromagnetically operated punching head suspended beneath table.

1,152,527. Fire-Alarm System. J. McFell, Chicago, Ill. Has main energized circuit with number of normally closed branches, each including transmitters, alarms, high-resistance test magnet and relay controlling alarms of other branches; operation of a transmitter shunts high resistance aand operates alarms.

1,152,536. Telephone Receiver. A. S. Moffat, assignor to Kunz-Garniss Co., Belmont, Mass. Diaphragm is operated by pivoted armature secured to its center and almost closing the magnetic circuit of the operating magnet.

1,152,541. Stop Motion. O. L. Owen, assignor to Whitin Machine Works, Whitinsville, Mass. Electrically operated throw-off mechanism in stop motion for lap-working machines.

1,152,562. Process of Producing Sound Records. J. C. Sherman, Brookline, Mass. A light path of varying width representing sounds is photographed on ribbon, developed and printed on ribbon of magnetic material, which is then subjected to etching bath to remove parts not covered by light path.

1,152,578. X-Ray Tube. R. H. Wappler, assignor to Wappler Electric Mfg. Co., New York, N. Y. Cathode focuses rays on reflector on anode and conductor point projecting from anode and outside the cathode stream directs current at center of cathode.

1,152,580. Electric Switch. L. Weidlich, Stratford, Conn. For portable lamp standard containing dry cell and lamp mounting.

1,152,581. Adjustable Reflector for Incandescent Lamps. L. Weidlich. Is provided with spring-wire device for securing to lamp bulb.

1,152,586. Electric Furnace. P. Wright, Seattle, Wash. Has smelting zone produced by electric heat; heat conducted from zone heats and dries ore to be smelted, and a preheating zone is between drying and smelting zones.

1,152,594. Alternating-Current Rectifying System. D. M. Bliss, assignor to T. A. Edison, Inc., West Orange, N. J. A number of polarized relays are connected in group with coils in series across alternating-current circuit and contacts in series in rectified circuit, the relays operating in synchronism with the alternating current.

1,152,599. Apparatus for Printing Positive Motion-Picture Films. H. O. Carleton, New York, and E. W. Nelson, New Rochelle, N. Y. Mounting of motor and lamp.

1,152,610. Method of Welding. J. H. L. de Bats, Zelienople, Pa. For welding hard and soft metals together; operation of heating, pressing together and cooling is carried out in a vacuum.

1,152,615. Alternating-Current Rectifying System. T. A. Edison, assignor to New Jersey Patent Co., West Orange, N. J. Groups, as in No. 1,152,594, are each fed from a section of a transformer secondary.

1,152,616. Contact for Electrical Apparatus. T. A. Edison, assignor to New Jersey Patent Co. Electromagnetic vibrator contacts have special structure for dissipating heat.

1,152,622. Alternating Current Motor. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Single phase; has main inducing winding and compensating winding, and induced member having commuted and short-circuited windings, exciting brushes, connected in series with main inducing winding at starting, short-circuited working brushes, and a magnetic shunt for diverting the magnetic flux from the short-circuited winding.

1,152,627. Thermo-Telephone or the Like. B. Gwozdz, Schöneiche, Germany. A Wollaston wire is secured between two halves of a divided body.

1,152,632. Oscillating-Current Meter. J. L. Hogan, Jr., assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. A wave meter comprising a resonant circuit having a variable tuning element and a potential coil shunted by a rectifier and condenser, with instrument to indicate the rectified current.

1,152,642. Electric Contact Device. A. A. Kent, Philadelphia, Pa. Details of sparking device.

1,152,643. Signaling Horn. A. A. Kent. Automobile horn having electromagnetically operated diaphragm.

1,152,646. Alternating-Current Rectifier. S. G. Langley, assignor to New Jersey Patent Co. Particular form of magnetic vibrator.

1,152,666. Windmill Control for Electrical Equipment. C. A. Sterner, assignor to H. L. Sterner, Allentown, Pa. Turbine type of wind motor has shutters for controlling its operation by wind which are automatically regulated under variable wind conditions.

1,152,675. Electrical Oscillator. F. K. Vreeland, assignor to Wirelesss Telegraph Exploitation Co., New York, N. Y. Means are provided for concentrating discharge in mercury-vapor tube; oscillations are excited in oscillating circuit by current variations in tube.

1,152,680. Electrically Insulated Bearing. C. E. Wieselgreen, assignor to Aktiebolaget Svenska Kullagerfabriken, Gottenburg, Sweden. Manner of insulating ball-bearing ring from its support.

1,152,681. Insulated Roller Bearing. C. E. Wieselgreen, assignor to Aktiebolaget Svenska Kullagerfabriken. Modification of above.

1,152,683. Dynamo-Electric Machine. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has annular shell within frame extending about end turns of winding.

1,152,697. Submarine Signaling. T. Bodde, Brant Rock, Mass. Sender secured to hull of vessel below water line has electrodes through which current is intermittently passed through water, thereby setting up sound waves in it.

1,152,703. Illuminated Sign. F. W. Burton, San Diego, Cal. Illuminated char-

acters on plates extending at right angles to base.

1,152,704. Motor-Car Signal. J. C. Butler, Pomona, Cal. Automobile direction indicator has interiorly lighted changeable sign and arrow on rotatable standard.

1,152,705. Binding-Post. G. A. H. Churchill, Rumson, N. J. Threaded stud has nut with helical wire adapted to grip conductor between its convolutions.

1,152,707. Trolley Pole. W. W. Clark, assignor of one-half to I. J. Boyce, Portland, Ore. Has means for positively aligning the harp and wheel with the conductor.

1,152,710. Non-Interfering Succession-Movement Fire-Alarm Signaling Machine. G. O. Cranmer and G. V. Tudhope, Oakland, Cal. Senders are electromagnetically interlocked.

1,152,722. Priming Device. F. M. Furber, assignor to A. R. Mosier, New York, N. Y. Special structure of spark plug permitting injection of gasoline into cylinder.

1,152,730. Electric Level-Indicator. G. E. Henderson, Manton, Cal. For electrically designating at a station the height of liquid supply at distant point.

1,152,731. Arc Lamp. C. Henrichsen, assignor to General Electric Co., Schenectady, N. Y. Includes arrangement for magnetically deflecting arc.

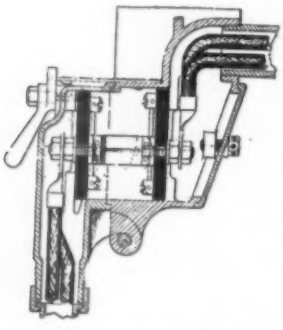
1,152,744. Revaporizer for Internal-Combustion Engines. B. MacNutt, South Bethlehem, Pa. Electric heater in pipe between carburetor and engine.

1,152,758. Electric Switch. C. D. Platt, Bridgeport, Conn. Structure of switch body and cover for push-button switches.

1,152,762. Trolley. W. F. Ream, Seanor, Pa. Manner of joining harp and pole end.

1,152,772. Cathode for Electrolytic Cells. F. G. Wheeler, assignor of one-half to Kimberly-Clark Co., Neenah, Wis. Perforated cathode supported by diaphragm having parts entering perforations and backed by electric conductor.

1,152,790. Switch and Signal System. R. V. Collins, assignor to Collins Switch & Signal Co., New York, N. Y. Train-controlled electric signals interlocked with switch-operating mechanism.



No. 1,153,019.—Connection Box.

1,152,791. Switch-Throwing Mechanism. R. V. Collins, assignor to Royal Engineering Corporation, New York, N. Y. Contact secured to trolley wire; is electromagnetically operated by trolley.

1,152,801. Liquid Rheostat. G. H. Dorgeloh, assignor to General Electric Co. Has main and auxiliary electrodes which are successively immersed.

1,152,806. Multiple Coin Chute. C. H. Green, assignor to National Piano Mfg. Co., Grand Rapids, Mich. Electromagnetically operated device for discharging the lowermost coin in chute.

1,152,807. Lamp for Vehicles. T. L. Griffiths, Birmingham, England. Electric lamp with globular body has front and rear hemispherical portions relatively rotatable to adjust attachments fitting on rear portion.

1,152,822. Battery-Controlling Device for Axle-Driven Generators. R. C. Lanphier, Springfield, Ill., and E. M. Fitz, Columbus, O. Connection of battery and lamps with generator controlled by ampere-hour meter.

1,152,841. Electrically Operated Piano-Player. W. C. Reed, assignor to Telelectric Co., Pittsfield, Mass. Playing magnets corresponding to notes are connected in parallel and a variable resistance in series insures predetermined current strength in all magnets whose circuits are closed.

1,152,842. Variable-Resistance Device. W. C. Reed, assignor to Telelectric Co. Resistances in two circuits are electromagnetically controlled and may be varied simultaneously or individually.

1,152,843. Circuit-Controller. W. C. Reed, assignor to Telelectric Co. Comprises series of spring-wire contacts resting on spring support balancing the collective pressure of the spring contacts.

1,152,877. Repeater for Telegraph Lines. H. C. Cahill, Akron, O. Special arrangement of relays, batteries, etc., for repeating electrical impulses.

1,152,878. Electric Lighting and Battery-Charging System for Vehicles. A. Churchward, Boston, Mass. Regulation secured by automatic control of resistances in shunt field and also in charging circuit.

1,152,880. Fault-Detector. W. H. Cole, Waltham, Mass. If one of three or more conductors in parallel in a system develops a fault, the unbalancing of the current automatically disconnects the faulty conductor from the system.

1,152,881. System of Electrical Distribution. W. H. Cole. Divided conductor having its two legs in parallel and insulated is automatically disconnected when insulation breaks down so that current can flow from one leg to other.

1,152,909. Trolley Hanger. W. T. Robinson, and C. D. Hylton, Ethel, W. Va. Particular structure of yoke for securing to guard timbers extending along trolley wire.

1,152,913. Electrical Regulating Device. R. E. Sagle, Roseville, O. Helical conductor on insulating cylinder; slider contacting with conductor moves longitudinally as cylinder is turned to vary amount of resistance in circuit.

1,152,914. Apparatus for Actuating Conduit-Covers and Collector-Plows for Electric Railways. D. Samaia, Milan, Italy. Automatic apparatus to open and close axial conduit covers, manipulate plow, switch, etc.

1,152,932. Automatic Fire-Alarm. W. F. Caldwell, assignor to J. A. Riggs, Hot Springs, Ark. Special arrangement of signals between subscribers and central stations.

1,152,942. Fire-Alarm System. F. Gottschalk Stirling, N. J. Thermostatic device controls telephone switch hook.

1,152,943. Wire-Clamping Device. W. L. Hall, Newark, O. For gripping wire to pull it; engages wire over large area.

1,152,950. Hot-Plate-Heating Means for Corn-Popping Machines and the Like. F. Hoke, assignor to Holcomb & Hoke Mfg. Co., Indianapolis, Ind. Rotary plate has heating resistor and switch for regulating it.

1,152,953. Means for the Prevention of Accidents on Railways. T. C. Kerr, Stevenston, Scotland. Collision-preventing means comprising partial circuits on two vehicles running on track rails acting as conductors, each of the partial circuits being adapted for connection with the rails and including a switch and battery cells controlled by a speed governor.

1,152,963. Non-Interfering Switch Device. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Specially adapted for telephone circuits: three or more push keys are interlocked to prevent operation of more than one at a time.

1,152,968. Subscriber's Autoswitching System for Intercommunicating Telephones. R. F. Pickens, St. Louis, Mo. Intercommunicating party line; party-line switch and receiver hook interlocked.

1,152,982. Method of Forming a Shell for a Spark Plug. W. E. Scherbondy, assignor to Bigsby Rotary Mfg. Co., Cleveland, O. Manner of forming metal shell with dies.

1,152,983. Process for Forming a Sheet-Metal Shell for a Spark Plug. W. E. Scherbondy, assignor to Bigsby Rotary Mfg. Co. Modification of above.

1,152,984. Tool for Forming Polygonal Sides Upon a Hollow Metal Shell. W. E. Scherbondy, assignor to Bigsby Rotary Mfg. Co. Relates to above.

1,152,986. Electrical Indicator. R. S. Smith, Jr., assignor of one-half to G. C. Gunn, Burlington, N. J. Comprises adjustable spark gap for connection in parallel with spark plug to test ignition.

1,153,003. Miner's Safety Lamp. M. Albrecht, Frankfort-on-the-Main, Germany. Battery lamp has diffusion chamber and U-shaped passage connected therewith, is interposed between the lamp and spectator, its limbs being adapted to display distinctive colors.

1,153,005. Spark Coil. B. Ames, Lowell, Mass. Vibrator formed of superposed metallic leaves has them secured together in such manner as to avoid noise and permit long make and quick break.

1,153,006. Armature for Magnetos. B. Ames. Particular structure facilitating assembling and insulation of primary and secondary coils.

1,153,019. Connection Box. W. F. Bouché, assignor to Gould Coupler Co., New York, N. Y. Two-part box permits removal of insulating plates carrying terminals and knife-blade contacts, to facilitate inspection, etc. (See cut.)

1,153,029. Telephone Attachment. J. H. W. Champion, Hermon, Cal. Automatic reel for winding receiver cord mounted in base of desk instrument.

1,153,037. Magnetic Ore-Washer. E. W. Davis, Minneapolis, Minn. Magnetic ore separator has material fed upwardly in inclined trough beneath which electromagnets are arranged.

1,153,039. Electric Horn. W. W. Dean, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Electromagnetic vibrator operates diaphragm of automobile horn.

1,153,044. Exterminator. J. E. Dunham, Portland, Ore. Electric light bulb is mounted within perforated cap at end of flexible tube through which fumes may be expelled.

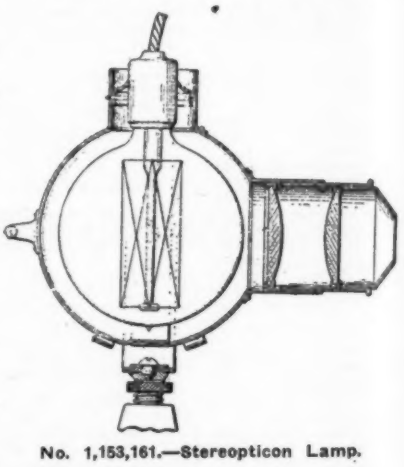
1,153,067. Ventilating Device. L. S. Hackney, St. Paul, Minn. Arrangement of motor and fans in cabinet of window ventilator.

1,153,076. Dynamo-Electric Generator. J. O. Heinze, Jr., Lowell, Mass. Special structure having stationary armature and rotating pivoted field-pole pieces which move away from armature under centrifugal force against action of spring.

1,153,110. View-Changing Device. C. F. Jenkins, Washington, D. C. Projecting apparatus is provided with electromagnetic means for advancing the film controlled from a distance.

1,153,127. Magnet-Charger. P. Lynch and H. Wochner, Rock Island, Ill. For permanent magnets; comprises adjustable energizing coil to accommodate different sized magnets with provision for maintaining electrical connections to the coils and good magnetic connections for the magnet in different positions of adjustment.

1,153,142. Float-Operated Circuit-Closer. D. F. Thomson, Bettsville, O. Double-cone-shaped structure on wall of liquid tank, through which float-operated stem passes.



No. 1,153,161.—Stereopticon Lamp.

1,153,161. Lamp for Stereopticons. H. M. Hill, Kirkwood, Mo. Special structure of housing surrounding and supporting lamp and having lens aperture. (See cut.)

1,153,168. Electrolytic Apparatus. I. H. Levin, assignor to International Oxygen Co., Newark, N. J. Has bipolar electrode, the anode surface being of nickel and the cathode surface of iron.

1,153,182. Purification of Coal. F. W. C. Schniewind, Englewood, N. J. Lustrous and non-lustrous coal constituents are electrostatically separated.

Patents Expired.

The following United States electrical patents expired on September 13, 1915:

610,524. Electrically Controlled Valve for Hydraulic Presses. W. B. Cleveland, Cleveland, O.

610,539. Electric Clock. F. Hope-Jones and G. B. Bowell, London, England.

610,620. Commutator Brush-Holder. W. K. Bassford, Jr., Bound Brook, N. J.

610,626. Composition Containing Casein for Electric Insulating or Other Purposes. P. H. Hansen, Copenhagen, Denmark.

610,704. Telephone System. W. W. Dean, St. Louis, Mo.

610,705. Brush for Electrical Machines. J. W. Dickey, New York, N. Y.

610,712. Apparatus for Starting and Controlling Electric Motors. T. W. Kloman, New York, N. Y.

610,726. Art of Bending Armored Conduit Tubes. W. T. Ruete, New York, N. Y.

610,767. Magnetic Separator. A. Monell, Munhall, Pa.